City of Portsmouth, Virginia
Floodplain Management Plan
And Repetitive Loss Plan

Photo courtesy of the Virginian Pilot

September 2010

A guide to help:

Determine At Risk Status

Reduce Damages and

Reduce Recovery Time and Effort

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EXECUTIVE SUMMARY

The Community Rating System (CRS) is a voluntary program under the National Flood Insurance Program that encourages communities to complete an assessment of the local floodplain management program. In exchange for undertaking this process, the citizens will pay reduced flood insurance premiums and are also better prepared to take advantage of other federal and state funding and grant programs. A key component in this assessment process is preparing and routinely updating the local Floodplain Management Plan. The City of Portsmouth prepared the first Floodplain Management Plan in 2005. This plan is the first review and update of that original plan.

The City of Portsmouth contains 33 square miles and is part of the Port of Hampton Roads, which is located 18 miles from open sea at the confluence of the Chesapeake Bay and the Atlantic Ocean. As an integral part of a working port, much of the City is dominated by maritime and military activities associated the port. The Port of Hampton Roads is the largest volume port on the East Coast, and handles in excess of 12 million tons of general cargo annually. The Norfolk Naval Shipyard is located along the Southern Branch of the Elizabeth River and employs approximately 7,400 people. In addition, the City contains the longest operating Navel Hospital in the Country. The City is also blessed with Portsmouth Navel Hospital, a historic downtown, and numerous historic residential communities.

The City of Portsmouth, like many costal cities, faces a year round threat of flooding. This threat results from storm surges associated with winter/spring coastal storms, summer/fall hurricanes, and urban flooding due to severe thunderstorms. This is compounded by the city's relatively low elevations which allows for non-tidal flooding of streets and private property due to the inability of large volumes of rainwater to drain through the storm drain system during times of high tides.

In the 20th century, Portsmouth has had numerous instances of substantial flooding relating to coastal storms or hurricanes, the greatest of which occurred in 1933 with the highest recorded tides in history at 8.9 feet to 9 feet above mean sea level. Most of downtown Portsmouth and other low-lying areas were under water. Flooding events in the first ten years of the twenty first century have continued to affect Portsmouth. Nine events form January 1, 2000 to August 1, 2008 have caused over 400 claims to be filed by residents and businesses for flood damages. The latest storm to affect the City of Portsmouth was the 2009 November Nor'easter, which exceeded the flood levels of the Ash Wednesday's storm and was within 6 inches of the 1933 storm. Estimates of damages to buildings alone topped $7 million with 120 property claims for flood damage filed to date.

The magnitude of the flooding problem is shown by the repetitive losses in the community. A Repetitive Loss Structure is a structure that has suffered flood damage on two or more occasions during a 10-year period. These repetitive loss structures nationwide account for approximately 2% of the insured properties but have received over 40% of the claims paid. In Portsmouth there were 181 claims from repetitive loss properties, with .8% of the city parcels in flood hazard districts account for 35% of the flood damages.

Floodplain management initially relied upon the floodplain study of the City of Portsmouth prepared by the Norfolk District of the Army Corps of Engineers in 1970, published May 1971. The first Flood Insurance Rate Maps (FIRMs) were created in 1983 and set base flood elevations from 8.5 to 9 feet in the city in areas along tidal rivers and streams. These maps were updated in 2009, converted to digital form and combined with the current capabilities of the City GIS system. There are approximately 5,500 parcels in the special hazard area.

A parallel issue that will compound the problem of flooding is the rise in sea level. Sea level is rising along most of the U.S. coast, and around the world. In Portsmouth a 1.46 foot rise in sea level has been documented during the past 100 years. Higher temperatures are expected to further raise sea level by expanding ocean water, melting mountain glaciers and small ice caps, and causing portions of Greenland and the Antarctic ice sheets to melt. The exact magnitude of increase has been debated, but ranges from between 0.6 and 2 feet to as much as 4.5 feet to 6 feet in the next century. This rise in sea level would result in a loss of between .042 and 2.58 square miles of land in the City of Portsmouth. This rise in sea level will become an increasingly important component of the City's Floodplain Management program.

Based upon the present Floodplain Management Plan and subsequent events of the past five years, the following is a list of major accomplishments:

- Staff prepared and updated an interactive map on the City's web site that allowed citizens 24 hour access.
- Obtained new Flood Insurance Rate Maps from F.E.M.A. on September 25, 2009
- Adopted new flood plain regulations that set a 1.5 foot freeboard requirement, created a new definition for substantial damage to reduce future claims, and prohibited storage hazardous materials in flood hazard zones.
- Prepared comprehensive Repetitive Loss Area maps.

Some of the major actions recommended as ongoing activities and in the short and long run include:

- Ongoing education of citizens and local officials about the complexities and challenges of managing floodplain areas and mitigating flood damages
- Maintain and enhance the interactive floodplain mapping available over the internet
- Flood proof key utility equipment demonstrated to be susceptible to flooding.
- Coordinate actions with those recommendations and actions contained in the Storm Drainage Study currently being undertaken under the direction of the City Engineer.
- Work with owners of properties that have demonstrated a repetitive loss to mitigate future flood related damages.
- Develop a series of strategies and potential funding sources for areas experiencing repetitive losses.

INTRODUCTION


Flooding along the 1700 block of High Street during Hurricane Isabel 2003

The National Flood Insurance Program (NFIP) provides federally supported flood insurance for communities that regulate development in floodplains and take active steps to mitigate the hazards of flooding. The Community Rating System (CRS), a voluntary program under the NFIP, grades community Floodplain Management Programs and reduces flood insurance premiums for citizens whose communities meet certain requirements. In order to reduce the potential for personal/property losses and ensure the lowest possible flood insurance rates for our citizens, the City of Portsmouth has pursued a program to maximize compliance with the standards of the Community Rating System. One facet of this compliance is the updating of the initial Floodplain Management Plan (adopted 2005) through the adoption of this new Floodplain Management Plan which will detail the City's flood hazards, our efforts to reduce losses during both tidal and severe rainfall events, and proposed actions for the future.

PURPOSE

The objective of floodplain management or hazard mitigation planning is to produce a program of activities that will best tackle the community's vulnerability to the flooding and meet other community needs. A well-prepared plan will:

- Ensure that a comprehensive review of possible activities and mitigation measures is conducted so that the most appropriate solutions are used to address the hazard.

- Ensure that the recommended activities meet the goals and objectives of the community, do not create conflicts with other activities, and are coordinated to reduce the costs of implementing individual activities.

- Educate residents about the hazards, loss reduction measures, and the natural and beneficial functions of floodplains and inform them as to their potential at-risk status

- Assist in reducing damages

- Assist in reducing recovery time and effort

- Build public and political support for projects that prevent new problems, reduce losses, and protect the natural and beneficial functions of floodplains.

- Build a constituency that wants to see the plan's recommendations implemented.

To accomplish these objectives it is suggested the following eight steps be followed:

1. Organize
2. Involve the public
3. Coordinate
4. Assess the hazard/problem
5. Set goals
6. Review possible activities and draft an action plan
7. Adopt the plan
8. Implement, evaluate, and revise

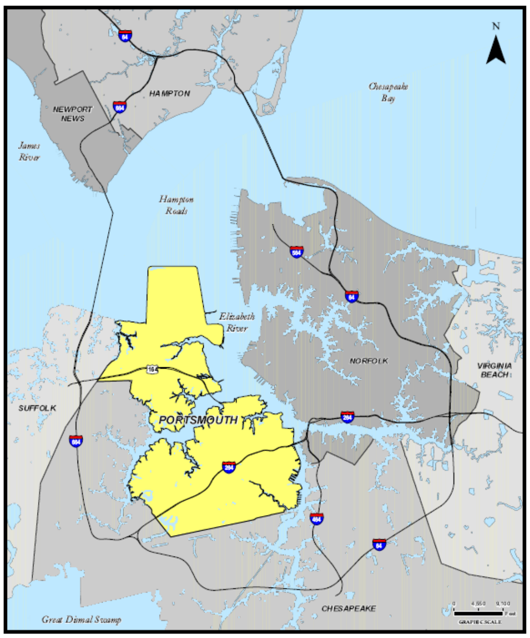
1. ORGANIZE

Authority

The authority to prepare, adopt and implement a plan to mitigate potential hazards to the Citizens of the City of Portsmouth can be found in the following:

- The NFIP does require that the local ordinance be legally enforceable and enforced uniformly throughout the community (44 CFR) and the Community Rating System Program requires the adoption of a local plan
- Sections § 10.1-546. Development of programs and plans and § 10.1-659. Flood protection programs; coordination of the Code of the Commonwealth of Virginia all allow the adoption of plans to mitigate and protect citizens' property and soil for flooding events

Location



The City of Portsmouth is located in the Mid-Atlantic portion of the Eastern Seaboard, in southeastern Virginia near the Hampton Roads harbor, where the James and Elizabeth Rivers join together and empty into the Chesapeake Bay. It is a historic seaport that contains the first naval shipyard and numerous historic communities. The City of Portsmouth was settled in 1752 and incorporated by the Virginia General Assembly in 1858. Over 250 years old, the city is home to one of the world's greatest natural harbors. Portsmouth, with a land area of approximately 30 square miles and a population of 100,565 people is located in the hub of the Hampton Roads Region. It is bordered by the cities of Chesapeake and Suffolk respectively to the south and west, and by the City of Norfolk to the east.

Background/History

With 75.8 miles of shoreline at the zero milepost of the Inter-coastal Waterway, which runs from Boston to Florida, Portsmouth's location on navigable waterways has been a dominant force in the City's history and economy. Its location on the over 40 feet deep Hampton Roads shipping channel, and the presence of both the CSX and Norfolk Southern Railroads supports the national and international port commerce activities and military presence in the region.

In Portsmouth as in many older costal communities, Portsmouth, for a period of time during the 1800 and early 1900's considered and used the marsh areas and creek beds as convenient dumping grounds for waste and debris. Through this filling of the marsh lands additional "dry" land was created and developed. However this new land was always in areas that were prone to flooding and thus began a vicious cycle of flooding events after flooding events. Overlaying a survey from 1823 onto a current base map of the Olde Towne area the map to the left was created that identifies the areas filled and then built on.

Portsmouth is an independent city chartered by the General Assembly of the Commonwealth of Virginia. The governing body of the City is the City Council, which formulates policies for the administration of the City. The City operates under a Council-Manager form of government with the City Council establishing the policies and laws for the administration of the City.

There is no overlapping debt or taxing powers with other political subdivisions. The water and sewer systems are operated on a self-supporting basis.

Existing Conditions

When a plan is in the development stage the first step is to assess the conditions. Through this assessment all interested parties develop an understanding of the current conditions that could in many instances dictate the direction of action presented in the plan. The A snap shot view of the City of Portsmouth reveals**:**

The City has adopted a Comprehensive Plan in 2005 that addresses continued participation in the National Flood Insurance Program (page 75 and 78 of the Comprehensive Plan).

56% of the land within the City of Portsmouth's boundaries is nontaxable property because of ownership by federal and state agencies, ownership by non-profit agencies and tidal wetlands that cannot be build on.

In the Appendix statistics based on the 2000 Census and the 2002 and 2006 estimates of the census bureau Portsmouth's population a snapshot description of the city can be found. Some unique statistics that bear strong consideration are the ones dealing with age, education and wages.

Geography Quick Facts Portsmouth Virginia		
Land area, 2000 (square miles)	33	39,594
Persons per square mile, 2000	3,032.7	178.8

The statistics highlighted above serve to paint a picture of a distressed urban population that has because of federal and nonprofit use of land and low income and education have limited means to address flood mitigation projects. Without the use of grants or state and federal projects financing is a true challenge.

2. INVOLVE THE PUBLIC

Destination Portsmouth

Beginning in late winter of 2007 the City of Portsmouth began using the "Destination Portsmouth Framework" to engage the public and develop the many new and upgraded development standards. From its beginning to present time the process was used successfully to update the Floodplain regulations, Chesapeake Bay Protection regulations the adoption of new Flood Insurance Rate Maps. Through public discussions of the flooding issues facing the City of Portsmouth three major additions were included in the adopted regulations. These additions were:

A. The adoption of freeboard requirements of 1.5 feet.
B. The adoption of a definition of substantial damage that uses cumulative values over a five year period and
C. Additional regulations that prohibited hazardous land uses from locating in "hazard" flood districts.

Additional public forums have been held to discuss the flooding issues in the Olde Towne portion of the City due to the November 2009 flooding events. To address these conditions the CRS Task Force created in April 2005 was reestablished. Two very real causes of flooding in Portsmouth have been identified in all of the staff and citizen meetings. These causes are tidal surge and storm water. Prior to beginning the update to the City's Floodplain Management Plan an update to the Stormwater plan was commissioned. This review of the storm water issues and solutions will be addressed once that review is complete.

Public Input

As part of the development of this plan staff has followed the "Destination Framework by:

1. Providing a "kickoff" to the project on May 24, 2010 with a presentation to the City Council. At this meeting the Council members and the public who have viewed the meeting on the City Channel 48 learned of the existence of the existing plan, the need for the plan revision and the draft time line

for its adoption.

2. An initial meeting of citizens who are most at risk was held on June 29, 2010. In keeping with the framework model, staff opened the meeting with a presentation on the history, accomplishments of Portsmouth's floodplain management program. Staff then solicited the public's concerns and comments. During the comment period which lasted approximately 1 and ½ hours, citizens provided their concerns about flooding conditions in Portsmouth. The major issue raised by participants, dealt with drainage and storm water concerns. Other issues included:
    a. street flooding in the 900 block of Portsmouth Boulevard
    b. a perceived rise in the water table
    c. lack of maintenance of ditches
    d. listing of questions from the Swimming Point neighborhood
    e. concern that taxes should not be spent to protect a few.
    f. suggested ways to reduce flooding, such as use fire trucks to pump water from the streets
    g. establish a citizen board who would have to authorize funds being spent on a community
    h. establish a priority listing for flood mitigation projects
    i. get more money from the government
    j. look at other communities and see how they got money from the federal government
    k. if possible establish a special tax, the proceeds of which could be used to provide flood protection or offset damages
3. Additional comments were received by email and regular mail until July 7, 2010.
4. A second meeting was held on July 15, 2010 to discuss the concerns presented and possible solution that are included in this document and "Future Dreams". The newspaper ad and post card notification used to inform the public of these meetings are include in the appendix.
5. The draft document was presented to the City of Portsmouth Planning Commission at is regular public hearing on August 3, 2010. At that time, in keeping with staff's desire to allow sufficient time for review and discussion, the matter was tabled until the September 7, 2010 public meeting.
6. Final adoption by City Council was obtained in September 2010.

CRS Task Force and Staff Input

In addition to the citizen input sessions described above, staff held numerous meetings with the CRS Committee identified on this document's Acknowledgement page. The purpose of these staff meetings were to first help develop concerns that staff faced daily in floodplain management. Next staff prepared and reviewed PowerPoint presentations for the public to make certain the public presentations were accurate from all aspects of the code and daily practices. Finally staff coordinated and prepared a listing of possible solutions that were reasonable. These solution can be found in the "future Dreams" section of this plan.

3. COORDINATE

All urban localities are unique mixes of development, location conditions, political activities and financial concerns. To coordinate these different facets of the urban community a description of each is needed. Once the unique conditions of each are identified the plan can then concentrate on the coordination of activities that address the needs of each. .

Physical

As previously indicated, the City of Portsmouth was founded in 1752. The city then grew in a series of annexations of the adjoining counties until 1968. At that time the surrounding counties incorporated into the Cities of Suffolk, Chesapeake and Virginia Beach. A copy of the annexation growth of the city of Portsmouth is provided in the appendix of this plan.

Commercial

The City of Portsmouth is 33 square miles in size (only 29 square miles are developable) and is characterized as a developed urban community. The development that is occurring is considered infill development. Recent Market Studies prepared as part of the long range plans for the city's Downtown area call for modest growth in the region and in Portsmouth over the next 10 to 15 years. Two reasons for this new growth were cited. First, Portsmouth is situated in the middle of Hampton Roads and offers a strategic location advantage to many small and large businesses and residents and second, many areas in Portsmouth lie within state and federal incentive zones.

Currently the most active redevelopment in Portsmouth is 135 acre development in Victory area known as Victory Village. This area is located south of the I-264 and Victory Boulevard interchange. The owner of the property, the Economic Development Authority (EDA) selected a master developer for this emerging business park. The Victory Village area plans created after this selection call for 1.2 million square feet of mixed use development.

Photo courtesy of the Virginian Pilot

The initial planning phase for the new Victory Village was completed in 2008. A major component of this development is the 35 acre Fred Beazley campus of Tidewater

Community College. This campus, which opened in January of 2010 already boasts an enrollment of over 11,000 students. The remaining 100 acres will be developed with a mixture of residential (not more than 25% of total square footage) and office retail.

Adjacent to the Victory Village area is the Newport complex which is a 1,600 unit residential community replacing the World War temporary housing complex known as Fairwood Homes. While this is an adjacent development to the Victory Village project a different developer has control of the project which is planned to be a mixture of single family detached and townhouse style urban development structures.

Military

Portsmouth's partnerships, service and reliance on the military has played a dominant role in the development of the city. The Gosport Shipyard, now known as the Norfolk Naval Shipyard is located along the Southern Branch of the Elizabeth River in the southern portion of the city. This facility has been active in the building, preparation and repair of ships for military use since the Revolutionary War and continues today. The facility experienced its largest workforce expansion in the war years of 1940-1960 (World War II and the Korean Conflict). At the height of employment, the Norfolk Naval Shipyard had over 40,000 employees working three shifts. This workforce has decreased in size to today's total workforce of approximately 7,400 employees.

In addition to the "shipyard" two other major military facilities are located in Portsmouth. They are:

1. The U. S. Medical Facility employing approximately 5,500 employees and located along the Elizabeth River near the downtown portion of the city and
2. The U. S. Coast Guard Support Facility employing approximately 1,900 employees and located in the Churchland part of the city.

Maritime

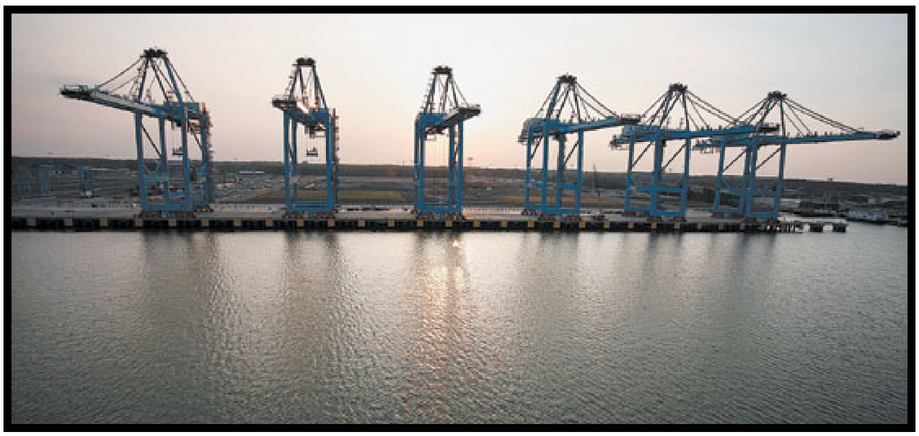
Ports and waterways are an important transportation element. Portsmouth is part of the Port of Hampton Roads, the world's largest natural harbor, just 18 miles from open sea at the confluence of the Chesapeake Bay and the Atlantic Ocean. A 50-foot channel depth allows the world's largest steamships to dock in the harbor. The Port of Hampton Roads is the largest volume port on the East Coast and the largest coal port in the world. Additionally, the port handles in excess of 12 million tons of general cargo annually.

The Portsmouth Marine Terminal (PMT) is one of four general cargo facilities owned and marketed by the Virginia Port Authority (VPA), the Commonwealth's leading agency for international transportation and maritime commerce. Three of the VPA's marine terminals, of which PMT is the second largest, are located in the Port of Hampton Roads. The fourth facility is the Virginia Inland Port, a truck and rail transfer facility in Front Royal, Virginia.

PMT covers 219 acres, including a 27-acre CSX rail facility with over 20,000 feet of direct rail access and 41 undeveloped acres. PMT has three shipping berths with 3,540 feet of marginal wharf. Five state-of-the-art container cranes handle containerized, break bulk and roll-on/roll-off cargo. One of these is the fourth Kone Supercrane with a lift capacity of 40 Long tons (LT). PMT is a versatile facility offering refrigerated hook-ups, specialized warehouse space, fumigation facilities and straddle-carrier container stacking.

The VPA 2010 Plan recommends a $46.4 million expansion of the PMT that includes: reconfiguring the site to maximize storage capability; paving remaining undeveloped terminal site for container storage, acquiring additional container-handling equipment, enhancing the gate to reduce the time that motor carriers have to spend on the terminal and reconfiguring existing rail facilities.

Universal Maritime Corporation borders PMT and offers an additional 1,000 feet of wharfs and two container cranes.



On September 7, 2007, APM Terminals Virginia officially opened its new $450 million, 291-acre container terminal on 576 acres of land to serve customers in the Hampton Roads region. This world-class maritime center is the third largest container terminal in the United States and is capable of handling 1 million twenty foot- equivalent units (TEU) annually. This creates the potential to expand the port to handle a capacity of more than 2 million TEU. The terminal will serve as an economic engine for new business in the region.

The yard area features weight-sensitive booths and remotely controlled cranes – the first of their kind in the United States. To ensure safety, drivers must exit their cabs and stand inside a booth before yard cranes can load their chassis. Remote control of cranes from an operations control center in the facility's main building minimizes exposure to potential safety hazards.

On July 6, 2010 Virginia Port Authority will begin leasing the APM facility. This move will allow a coordinated maritime effort with all of the Hampton Roads ports under one flag.

Medical

Midtown Portsmouth, the most central location of the city, is home to Bon Secours Maryview Medical Center. Maryview Medical Center Bon Secours is an acute care facility with 346 beds offering comprehensive medical services and has approximately 2,000 employees. Since 2000, Maryview has renovated and expanded its emergency room and added a birthing center and dialysis facility. In 2004 Maryview began construction on an open-heart surgery center. As a result of Maryview's long-standing commitment to the community, a host of entrepreneurial healthcare facilities dominate the area, as it is a Mecca for healthcare related opportunities.

In April of 2010 Marview unveiled a major expansion project that would require 10 to 15 years to complete. The plans call for a 60,000 square foot addition to the lobby and bed tower, the construction of a 3 to 4 story building that would house outpatient services, such as imaging, sports medicine, cancer and orthopedic care.

As a compliment to Maryview and the City of Portsmouth is the U.S. Naval Medical Center, Portsmouth, the Navy's regional medical center and the nation's oldest continuously operating hospital, military or civilian. The corner stone was laid in April of 1827 and the first patients admitted in 1830.


Photo courtesy of the Virginian Pilot

Housing

The City of Portsmouth's housing has been developed over the past three centuries. Currently there are five predominately residential historic districts that delineate the most significant areas of historic housing and commercial buildings. These districts are, Olde Towne, Park View, Cradock, Truxtun and Port Norfolk. Portsmouth's sixth historic District is located along the High Street Corridor in the original downtown area and is predominately a commercial historic area.

The condition of housing within the city, because of age and wide range of maintenance activities, or the lack thereof, can be described as poor to good.

Multifamily development is present in virtually all parts of the city's residential neighborhoods. Large complexes, those with over 16 units in the complex comprise approximately 50% of the tenant occupied properties in the city.

The development of the housing stock, single-family and multifamily has occurred along all of the various rivers, streams and creeks that bisect the city.

Schools

Currently there are three high schools, three middle schools, fourteen elementary schools and two preschool centers in the city. Additionally there are four special centers that deal with learning, physical and mental disabilities and disciplinary challenged students.

Power Generation

Electric power for the entire civilian portion of the city is obtained from a series of above ground and below ground power transmission lines.

Water Systems

The potable water supply is provided through a series of water mains that are supplied from a series of wells and lakes in the City of Suffolk. This system is approximately 100 years of age.

Modifications to the dams, and pumping system have been made to prevent the reoccurrence of the flooding damages realized during the 1999 Hurricane Floyd event.

Transportation

In December 2009 the City of Portsmouth adopted its first Master Transportation Plan. In addition to creating a detailed listing of intersections that routinely flood the following specific recommendation was made.

Recommend I-264 interchange improvements at Victory Boulevard, Portsmouth Boulevard, and Frederick Boulevard for inclusion in the Long Range Transportation Plan (LRTP). Today the Portsmouth Boulevard interchange does not provide full-movement access between the local streets and Interstate I-264. Approximately one mile to the west, the Victory Boulevard interchange provides full-movement access to I-264 as well as to local streets (Cavalier Boulevard and Belmont Avenue).

Victory Crossing, one of the regional activity centers identified in the Destination 2025 Comprehensive Plan, is located between these two interchanges. Development is moving forward in and near this activity center, including

Victory Village Business Park, New Port, and the new Tidewater Community College campus. During the planning stages of these developments, traffic impact analyses have indicated that the Victory Boulevard interchange is reaching capacity. Given the limited available right-of-way at the Victory Boulevard interchange, development strategies should look at enhancing the local street connections between Victory Boulevard and Portsmouth Boulevard and seek to provide full-movement access at the Portsmouth Boulevard interchange. The Portsmouth Boulevard interchange has a larger footprint than the one at Victory Boulevard, and interchange alternatives should seek not only to provide full access but also to provide enhanced connections to the local street network. The I-264 interchange with Frederick Boulevard suffers from serious congestion problems. Due to the design of the surrounding roadway network, this interchange is prone to flooding during periods of heavy rains. This causes significant delays for vehicles that must seek alternative access routes, requiring a minimum 2-mile detour. The geometry and traffic control of this interchange should be reevaluated to determine a design that will most efficiently and safely accommodate existing and future traffic. The following is an initial listing of streets that are known to routinely flood:

- Frederick Blvd North exit I-264
- Intersection of Washington and High
- 1600 Blk of High St
- Victory Blvd exit I-264 west bound
- Intersection Columbia and Crawford
- 100 and 200 Blk Crawford Pkwy
- 5900 Blk Arden Street
- 5900 Blk Blaine Street
- 4100 Blk Queenswood Drive
- 3100 Blk Verne Avenue
- 400 Blk Douglas Avenue
- 300 Blk Maryland Avenue
- 400 Blk Florida Avenue
- 1 - 17 Blk Greeneland Boulevard
- 4000 Blk Scott Street
- 3800 Blk High Street
- 300 Blk Effingham Street at London Boulevard
- 1000 Blk Effingham Street at I264 overpass
- 500 Blk High Street at Washington Street

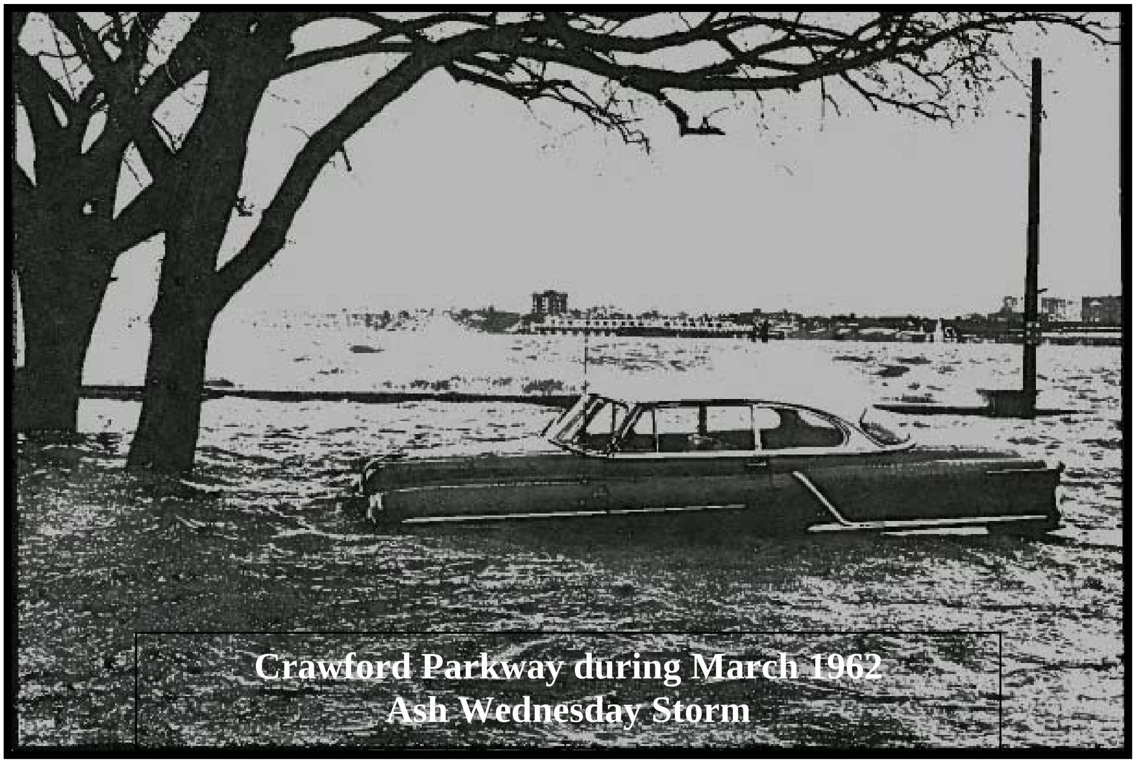
- 2000 Blk Frederick Boulevard
- 700 - 1200 Blk Elm Avenue
- 400 Blk Portsmouth Boulevard
- 1300 Blk Portsmouth Boulevard
- 300 Blk Gust Lane
- 100 Blk Allard Road
- 1600 Blk Spectator Street
- 300 Blk Dinwiddie Street
- 4800 - 5600 Blk Vick Street
- 4900 - 5200 Blk Johnson Avenue
- 1500 Blk County Street
- 900 block of Portsmouth Boulevard

Impact on Public Facilities

A review of principal facilities in the city indicates the following are located in or near Flood Hazard Districts:
City Hall Building, Courts Building, City Jail, I. C. Norcom High School, Police Headquarters, 911 Emergency Dispatch Center, Emergency Operation Center, Probation Offices, Behavioral Healthcare Offices, Administrative Office for the Fire Department, and Ntelos Pavilion.


Photo courtesy of the Virginian Pilot

There are other locations in the city where major thoroughfares are located within floodplains. In addition, numerous streets that are not in hazard districts routinely flood during storm events such as severe thunderstorms. This factor is due to the relatively low elevations of land and the presence of a number of tidal rivers and creeks that bisect many areas of the city. Vehicular circulation in sections of the city near the various branches of the Elizabeth River would be slowed or halted during severe tidal flooding. This could hamper evacuation measures and emergency services to certain areas of the city.



Crawford Parkway during March 1962
Ash Wednesday Storm

Please note the similar conditions that are displayed in this photograph and the photograph on the cover of this plan.

4. ASSESS THE HAZARD/PROBLEM

Background

The City of Portsmouth, like all costal cities, faces numerous types of natural disasters. To help address the planning and recovery from the potentially disastrous affects of these events, a regional all hazards plan was prepared and adopted by the various Hampton Roads local governing bodies. This plan, titled "The Southside Hampton Roads Hazard Mitigation Plan" is the result of a comprehensive planning process undertaken by the jurisdictions of Isle of Wight County, Norfolk, Portsmouth, Smithfield, Suffolk, Virginia Beach and Windsor. Local officials, citizens and other key stakeholders from across the region contributed to the planning process. This process was designed to help communities identify ways to better protect people and property from the effects of natural hazards. Included in this plan is an evaluation of risks for all hazards in the region. Table 5.36 summarizes the degree of risk assigned to each category for all identified hazards in the region based on the application of the Priority Risk Index (PRI) tool fully introduced in "Methodologies Used."

Table 5.36: Summary of Qualitative Assessment

HAZARD	CATEGORY/DEGREE OF RISK				
	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
Flood (100-Year)	Highly Likely	Catastrophic	Moderate	More than 24 Hours	More than 1 Week
Flood (Storm Surge)	Possible	Catastrophic	Moderate	More than 24 Hours	Less than 24 Hours
Hurricanes and Tropical Storms	Likely	Catastrophic	Large	More than 24 Hours	Less than 24 Hours
Severe Thunderstorms	Highly Likely	Minor	Large	Less than 6 Hours	Less than 6 Hours
Lightning	Highly Likely	Limited	Small	Less than 6 Hours	Less than 6 hours
Tornadoes	Highly Likely	Critical	Small	Less than 6 Hours	Less than 6 Hours
Winter Storms	Likely	Critical	Large	More than 24 Hours	Less than 1 Week
Erosion	Likely	Minor	Small	More than 24 Hours	More than 1 Week
Earthquakes	Unlikely	Minor	Large	Less than 6 Hours	Less than 6 Hours
Landslides	Unlikely	Minor	Small	Less than 6 Hours	Less than 6 Hours
Sinkholes	Possible	Minor	Negligible	Less than 6 Hours	Less than 1 Week
Drought	Possible	Minor	Large	More than 24 Hours	More than 1 Week
Wildfire	Highly Likely	Minor	Small	Less than 6 Hours	Less than 24 Hours
Dam/Levee Failure	Unlikely	Critical	Small	Less than 6 hours	Less than 24 Hours
Tsunami	Unlikely	Catastrophic	Moderate	Less than 6 Hours	Less than 6 Hours
Extreme Temperatures	Possible	Minor	Large	More than 24 Hours	Less than 1 Week

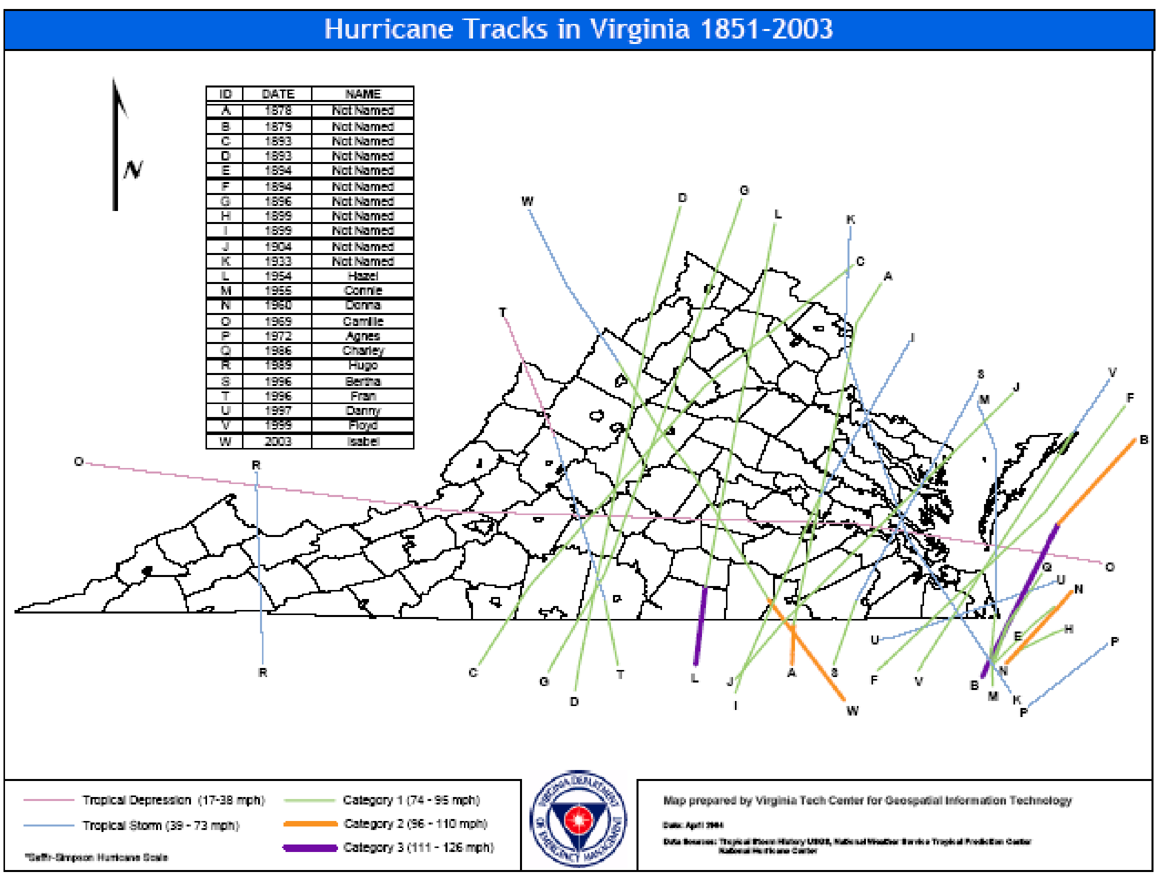
e Hampton Roads Mitigation Planning Committee

Assigned risk levels were based on historical and anecdotal data, as well as input from the Mitigation Planning Committee. The results were then used in calculating PRI values and making conclusions for the qualitative assessment.

As one can see Table 5.36 shows there exists a year round threat of flooding to the City of Portsmouth. This threat resulting from, storm surge associated with winter/spring coastal storms and summer/fall hurricanes and urban flooding due to severe thunderstorms have a probability of "Possible" to "Highly Likely". Also, the city's relatively low elevations result in non-tidal related flooding of streets and private property which are located within and outside the floodplains. This flooding is related to the inability of large volumes of rainwater to drain through the storm drain system during times of high tides. Because the flooding threat has such level of occurring this Floodplain Management Plan is being developed.

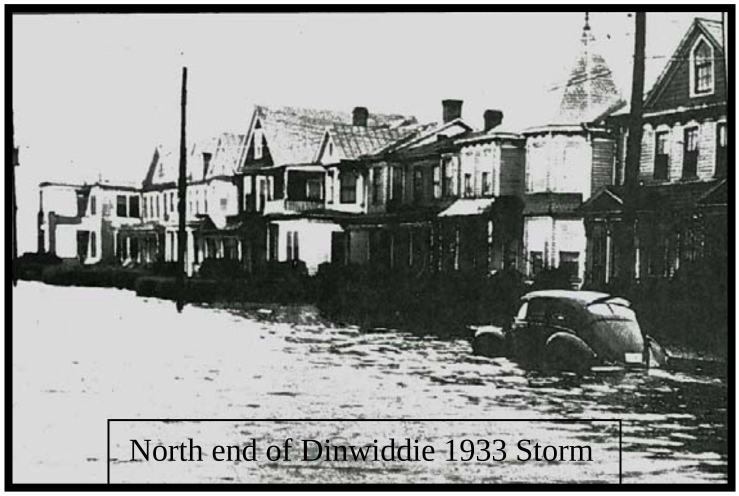
Portsmouth's Flooding History

The City of Portsmouth and the Hampton Roads region have witnessed a number of hurricanes and coastal storms over the past 300 years. Probably the most famous prior to this century occurred in 1749. This storm was so severe that it reshaped a portion of Norfolk's Chesapeake Bay shoreline by creating a spit of land approximately two miles



long and a quarter mile wide. This area in Norfolk is known as Willoughby Spit and has since become a substantial residential area.

In the 20th century, Portsmouth has had numerous instances of substantial flooding relating to coastal storms or hurricanes. The greatest of these storms occurred in 1933 ("K" on the map) resulted in the highest recorded tides in history at 8.9 feet above mean sea level in the harbor (Isabel recorded a 7.89 feet high tide at the Sewells Point Station). While this storm included minimal rainfall (1.24 inches in 24 hours), the storm surge produced by the storm coincided with the astronomical high tide, thus resulting in severe flooding. Most of downtown Portsmouth and other low-lying areas were under water. There was severe wind damage to many buildings and flood damage to many wharves and docks in the harbors. Another major storm in 1936 resulted in slightly less flooding and damage.


North end of Dinwiddie 1933 Storm

While not associated with flooding conditions the hurricane of 1944 was probably the greatest storm in intensity in the region's recent history. However, the storm moved very quickly and the accompanying storm surge was of short duration and occurred at the time of the astronomical low tide. Therefore, even though there was heavy rainfall, the damage relating to tidal flooding was minimal. The greatest structural damage resulted from winds clocked in excess of 130 miles per hour. This storm is important because it illustrates what could happen during a hurricane of similar intensity under different conditions relative to path, speed, time of storm surge in relation to tides, and direction of approach.

In 1954 a coastal storm produced relatively minor flooding. In 1956 a low-pressure system off the coast (commonly known as a Nor'easter) produced prolonged northeasterly winds resulting in tides about 4 feet above normal. A maximum flood crest of 6.5 feet occurred resulting in flooding of much of the low-lying areas of the city. In 1960 a storm produced a storm surge of 7 feet that resulted in flooding equivalent to the 1956 levels.


Washington and High Street March 1962

Another benchmark storm and one often referred to by long term residents is a coastal storm in March 1962 known as the “Ash Wednesday Storm”. This storm, like the one in 1933, produced relatively small amounts of rainfall (2.25 inches in 48 hours). However, the storm’s track and slow movement resulted in a prolonged storm surge that inundated downtown Portsmouth. The flooding occurred when the winds did not allow the release of five tide cycles. This constant building of one high tide on another produced a storm surge of approximately 7.4 feet, which was at the time the third highest record tide in the history of the Sewells Point gauge.

Between 1962 and 1990 the Hampton Roads area has also experienced several less significant storms and floods. A nor’easter during the winter and spring of 1977 and 1978 caused damage in excess of $2.5 million. The Hampton Roads area barely missed the effect of Hurricane Gloria in September 1985.

At the end of the twentieth century Floyd in 1999 produced flooding damage different from all of the other storms. Floyd arrived as a weak tropical storm after several fronts had moved through the area leaving saturated ground. Floyd then proceeded to produce rainfall in excess of 20 inches in a 24 hour period. This rainfall produced urban storm water that, while not affecting the properties within the city, caused extensive damage to the City of Portsmouth’s water system located in Suffolk, Virginia.

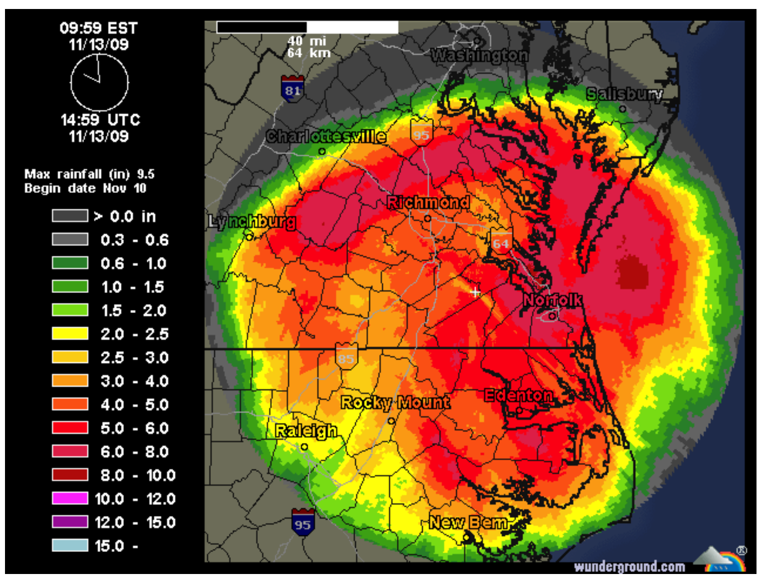
Flooding events in the first ten years of the twenty first century have continued to affect Portsmouth. Nine events form January 1, 2000 to August 1, 2008 (the latest date information is available from FEMA) have cause over 400 claims to be filed by residents and businesses for flood damages. Of these nine events one event, Hurricane Isabel was responsible for over 320 claims for flood looses being filed. These flood losses had a total value of approximately 3.4 million dollars.

Isabel arrived in Portsmouth as a strong tropical storm/weak category 1 hurricane September 18/19 2003. While this storm was considered by many a weak system it produced flooding conditions within 1 foot of the 1933 storm. In addition to the flooding conditions extensive tree damage occurred throughout the City of Portsmouth. The hardest hit neighborhoods included Cavalier Manor, and Churchland.

The 2009 November Nor'easter is the latest storm to affect the City of Portsmouth. On November 11, 2009 the remnants of tropical storm Ida combined with a series of fronts to produce an extremely strong northeast storm that would remain over the area for the next 5 days. Because of the continuous piling on of high tides without a release the final tides of Friday November 13, exceeded the flood levels of the Ash Wednesday's storm and were within 6 inches of the 1933 storm. The chief factors that caused the damages of this storm to be so great were:

1. The reoccurring tides over a 4 day period and
2. The tremendous amount of rain Ida-ex dumped over the coast added to the storm surge. Final damage figures are still being calculated by this storm and expectations are that damages to buildings alone will top $7,000,000.00. To date 120 property claims for flood damage are known to be paid as this is the increase in repetitive loss structures because of the storm.

This radar image shows rainfall totals that affected the area during this storm. Radar-estimated rainfall from the Norfolk radar shows a large area of 4 - 5 inches of rainfall over coastal Virginia and North Carolina.



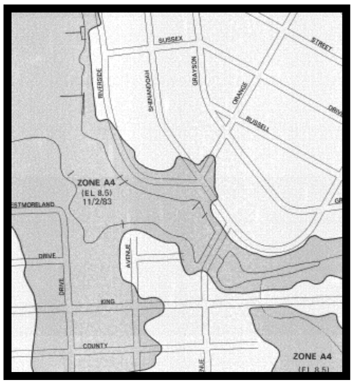
Of the ten major flooding events that have occurred in Portsmouth eight occurred between August and October, which is hurricane season along the Atlantic seaboard. The other two storms were late winter/early spring nor'easters.

While Portsmouth today certainly faces the same threat of storm related flood damage, faced in the 17 and 18th centuries and some areas are the same, many of the city's characteristics such as density development patterns, street patterns have changed. Some flood prevention measures have been undertaken; and flood related land use regulations have been developed. The next section discusses the evolution of floodplain regulations in Portsmouth.

Floodplain Regulations Development

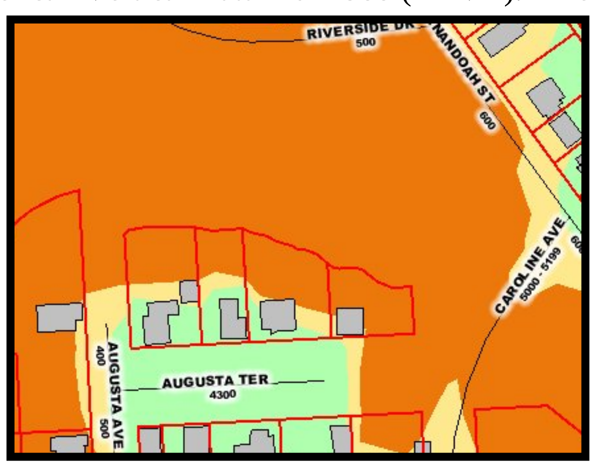
The initial floodplain study of the City of Portsmouth was prepared by the Norfolk District of the Army Corps of Engineers in 1970, published May 1971. An interim Flood Insurance Rate Map (FIRM) was made July 1, 1974 to change flood zone designations. FIRMs were again changed November 25, 1975 to reflect curvilinear flood boundaries and to add special flood hazard areas.

A supplemental Flood Insurance revision was made on May 2, 1983 which created new FIRMs date November 2, 1983. This study included the effects of wave action for the Hampton Roads area at the confluence of the Elizabeth and James Rives. Because of these analyses, flood zones have been established within which base flood elevations range from 8.5 to 9 feet National Geodetic Vertical Datum (NGVD) 1929 generally in the city in areas along tidal rivers and streams.



Using this data as a base it was estimated that approximately 1/3 of the properties in the City are partially or wholly in a Flood Hazard District. With approximately 35000 parcels in the city, a raw estimate of approximately 9,900 parcels in the special hazard area was used for planning purposes. The areas most greatly impacted by floodplains and other storm related hazards such as wind and wave damage are the residential areas along the Elizabeth River (southern and western branches), Paradise Creek, Baines Creek and Scott's Creek.

In the spring of 2005 the Army Corp of Engineers began the process of updating the 1983 Flood Insurance Rate Maps. Numerous meetings with staff were held to provide an understanding of the process that would be used and the materials that may be existing to help prepare the most accurate maps possible. The hydrologic and hydraulic analyses conducted in 1979 and 1980 were not revised or updated. However, effective floor elevations were converted to the North American Vertical Datum of 1988 (NAVD). The previous FIRMs were converted to digital format utilizing aerial photography as the base map, flood boundaries were revised to reflect updated topographic data. Based on a comparison of the previous (1983) FIRMs and the 2009 FIRMS, approximately 1,500 parcels were added to the special hazard districts and approximately 1,200 parcels were removed from hazard districts. Using the new digital maps combined with the current capabilities of the City GIS system, approximately 5,500 parcels are in the special hazard area.



In addition to referencing the adoption of new maps September 25, 2009, the flood regulations for the City of Portsmouth were amended to provide the following:

- Eliminates term "Mangrove" from the regulations
- Eliminates term "floodway" from the regulations as the City of Portsmouth's map does not contain "floodways"
- Prohibits storage of petroleum products or hazard materials in hazard districts
- Adds regulations for 1.5 foot "freeboard"
- Adds regulations for "repetitive loss structures"

To assist citizens in determining their at risk status the City of Portsmouth has created an interactive mapping application that can be accessed via computer and the internet. This allows all interested persons the ability to view the existing and past flood maps, surge projections, and evacuation routes. The link to the site is **http://www.portsmouthva.gov/** . The following information sheet may help in navigating to and around the site.

THE CITY OF PORTSMOUTH

Accessing the City of Portsmouth's Interactive Map using www.portsmouthva.gov

In the center column of the main page, scroll down to
- Interactive Services
- Select *Interactive Map*

The next page is titled *Land Information System*
- Click the link that is in bold print titled *Select Properties, Multiple Layers and Export to Excel*

Once the page has loaded read the disclaimer
- Click *I AGREE*

The map should then load showing Portsmouth and the surrounding cities.

At the bottom of the screen in the *Value* box enter the property address you would like to research and click *Execute*.

Accessing Flood Map	Accessing Zoning Map	Useful Buttons
On the right side of the screen under *Layers* scroll down until you see *Current Flood Zones.* Then click on that box and this will help you determine the flood zone in which the property is located.	On the right side of the screen under *Layers* scroll down until you see *Current Zoning* and *Proposed Zoning.* Then click on that box and this will help you determine the current zoning and proposed zoning of the property.	Start new search To drag the screen Zoom in Zoom out

Still need help? Give us a call at 757.393.8836
Department of Planning

FLOODPLAIN MANAGEMENT PLAN
FINANCIAL ASPECTS

ONE IMPORTANT NOTE THAT NEEDS TO BE REMEMBERED, FEMA IS NOT HERE TO BAIL YOU OUT. YOU MUST HAVE A FLOOD INSURANCE POLICY BEFORE THE FLOODING EVENT BEFORE ANY GRANTS CAN BE APPLIED FOR.

Living or working in a floodplain has numerous challenges. Of these challenges the financial aspect is one that requires specific discussion. The majority of the City of Portsmouth was developed before mandatory construction regulations and insurance policies were available. Of the approximately 5,500 parcels that are wholly or partially in the AE* hazard zone (as shown on the September 25, 2009 Flood Insurance Rate Maps for the City of Portsmouth, Virginia) with buildings valued at over $1,000.00 approximately 68% of the properties were constructed before the City adopted floodplain management regulations.

*Note: the AE and V zones identify properties that have at least a 1% chance of receiving flood damages during a 100 year period.

For private citizens and business owners the financial question involves two components. Those components are 1) Insurance Premiums and 2) damages from flooding events. For the local government these question of floodplain management can be divided into two areas:1)general budget and 2) grants.

Insurance Premiums

The National Flood Insurance Program establishes the premium fees for the different types of policies. Because the fees are set at this level the yearly policy cost should be the same regardless of the company submitting the policy if the coverage is the same. It is best to discuss your coverage types and limits with your insurance agent.

There are currently three main types of policies available. These policies are for buildings located outside of a flood hazard district, buildings located partially or wholly in a flood hazard district and recently added is a policy a policy for those properties that are listed in a hazard district due to a recent map change.

Policies for buildings located partially or wholly in a flood hazard district are further divided into two subgroups. These subgroups are “Pre-firm” and “Post-firm”. Pre-firm policies are prepared for those buildings built prior to local regulations have been adopted. Post-Firm polices are prepared for those buildings built after local regulations being adopted. Generally the rates for complying post-firm policies are less than pre-firm policies. A pre-firm property owner can have their property considered for post-firm rates by submitting an elevation certificate from a private surveyor but if the floor level is too low, the building contains a basement or the vents in the foundation are not the correct size or material no adjustment will be made.

Flood Damages

Flood damages affect both the building and contents of the building. While insurance may be purchased in the event of a flood it will not provide a full replacement of everything damaged. Flood insurance policies typically do not cover pictures, crafts and the like. Policies also carry a deductible that reduces the amount that can be collected after a loss. Again, it is best to discuss your coverage types and limits with your insurance agent. If the building is damaged more that 50% of the market rate, cumulatively during a ten year period, then the structure is declared substantially damaged and the repairs must include actions to bring the structure into full compliance with the current regulations. This level of damage requires the building to be classified as "Substantially Damaged".

Grants

The City of Portsmouth and at times its citizen's funds are available to help reduce flood damages and losses. At this time there are four basic grants that the Federal Emergency Management Agency (FEMA)and or the National Flood Insurance Program sponsor. All but the ICCC are competitive grants and many very specific guidelines and deadlines that must be met to be considered. Likewise only the ICCC grant can be applied for by the homeowner. The application for all others must be through a political subdivision i.e. the City of Portsmouth. All grants require that all persons/property receiving a benefit must be forever protected by a Flood Insurance Policy. The purpose of this section is not to provide a detailed description of all grants available but to identify the ones that are known so the home or business owner can seek more information.

ICCC (Increased Cost of Compliance Construction)

The Increased Cost of Compliance Construction claims payments are only availabel to flood-related damage and properties that have been declared substantially damaged or repetitive loss structures. These funds are to be used to elevate, relocate, or demolish a residential structure or flood proof nonresidential structures. The coverage is available regardless of whether the flood results in a Presidential disaster declaration or not. There is a maximum pay out of $30,000.00 with this program. Additional funds necessary to complete the project are the responsibility of the property owner. Additional guidance can be obtained from FEMA publication FEMA P-301. Please visit the links section in the Appendix for information obtaining all FEMA documents.

HMGP (Hazard Mitigation Grant Program)

The Hazard Mitigation Grant Program (HMGP) provides grants to State and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Additional guidance can be obtained from FEMA's website http://www.fema.gov/government/grant/hmgp/index.shtm

FMA (Flood Mitigation Assistance)

The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP).

FEMA provides FMA funds to assist States and communities implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program.

PDM (Pre-Disaster Mitigation)

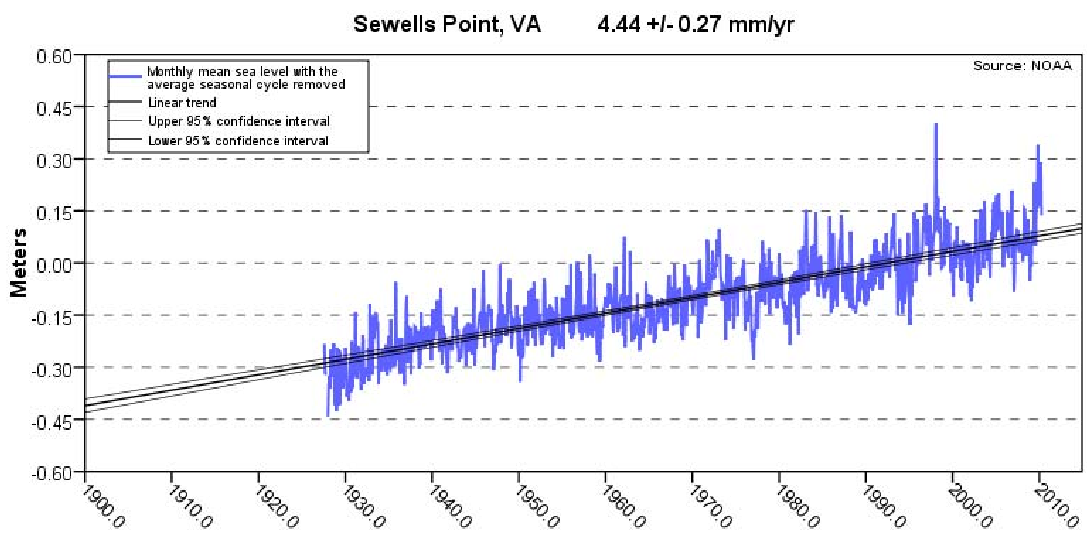
The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event.

Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

SEA LEVEL RISE

When the City of Portsmouth was founded approximately 400 years ago the Chesapeake Bay, James River and Elizabeth River were major factors in the success of the new settlement. The water ways provide a cheap and efficient form of transportation, provided a wealth of food items in the form of several species of fish, crabs and oysters, and provided the potential for economic development in the form of ship building and repair. Over these 4 centuries these benefits have helped secure Portsmouth's growth. However today the very features that have provided jobs, views and recreation threaten to damage or remove the land along our waterfront.

Mean Sea Level Trend
8638610 Sewells Point, Virginia



The mean sea level trend is 4.44 millimeters/year with a 95% confidence
interval of +/- 0.27 mm/yr based on monthly mean sea level data from 1927 to 2006 which is equivalent to a change of 1.46 feet in 100 years.

Sea level is rising along most of the U.S. coast, and around the world. In the last century, sea level rose 5 to 6 inches more than the global average along the Mid-Atlantic and Gulf Coasts, because coastal lands there are subsiding. In Portsmouth using the tidal gauge at Sewells Point a 1.46 foot rise in sea level has been documented to a 95% degree of accuracy during the past

100 years.

EPA, in coordination with the U.S. Geological Survey and the National Oceanic and Atmospheric Administration, has published a report, "Coastal Sensitivity to Sea Level Rise: A Focus on the Mid-Atlantic Region." The study is one of 21 climate change studies being conducted by the U.S. Global Change Research Program (USGCRP). This report discusses the possible impacts of sea-level rise and how governments and communities can respond to rising waters.

Higher temperatures are expected to further raise sea level by expanding ocean water, melting mountain glaciers and small ice caps, and causing portions of Greenland and the Antarctic ice sheets to melt. The International Panel on Climate Change (IPCC) estimates that the global average sea level will rise between 0.6 and 2 feet (0.18 to 0.59 meters) in the next century (IPCC, 2007).

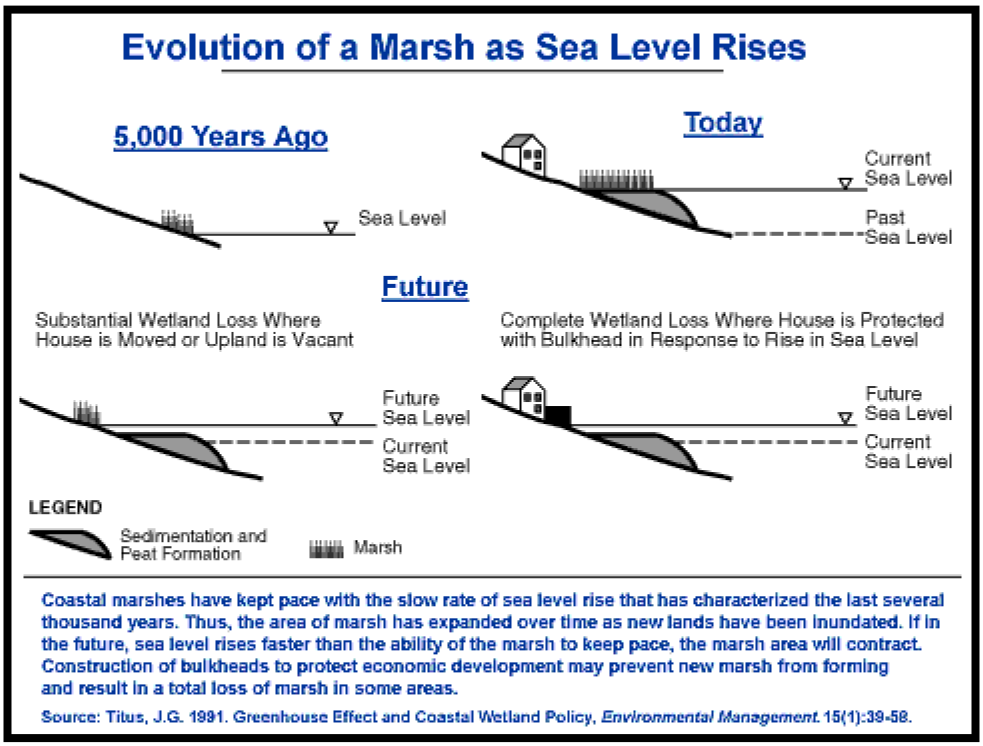
Recently this range of rise has been criticized as being two low. Recent satellite data and a tremendous acceleration of the melting of the Greenland and Antarctica icecaps have caused most members of local, state and federal agencies to plan for a rise along the eastern coast of the Atlantic of approximately 4.5 feet to 6 feet. Rising sea levels inundate wetlands and other low-lying lands, erode beaches, intensify flooding, and increase the salinity of rivers, bays, and groundwater tables. Some of these effects may be further compounded by other effects of a changing climate. Additionally, measures that people take to protect private property from rising sea level may have adverse effects on the environment and on public uses of beaches and waterways. Some property owners and state and local governments are already starting to take measures to prepare for the consequences of rising sea level. A map of the areas that could be inundated with sea level rise of 0-2 feet, 2-4 feet, 4-6 feet and 6-8 feet is provided in the appendix. Using this mapping the following land area would be lost from the current City of Portsmouth area:

A. 0-2 feet sea level rise would result in 0.42 square miles being lost
B. 2-4 feet sea level rise would result in 1.16 square miles being lost
C. 4-6 feet sea level rise would result in 2.58 square miles being lost
D. 6-8 feet sea level rise would result 6.05 square miles being lost

Land Loss

Coastal wetland ecosystems, such as salt marshes and mangroves are particularly vulnerable to rising sea level because they are generally within a few feet of sea level (IPCC, 2007). Wetlands provide habitat for many species, play a key role in nutrient uptake, serve as the basis for many communities' economic livelihoods, provide recreational opportunities, and protect local areas from flooding.

As the sea rises, the outer boundary of these wetlands will erode, and new wetlands will form inland as previously dry areas are flooded by the higher water levels. The amount of newly created wetlands, however, could be much smaller than the lost area of wetlands - especially in developed areas protected with bulkheads, dikes, and other structures that keep new wetlands from forming inland. The IPCC suggests that by 2080, sea level rise could convert as much as 33 percent of the world's coastal wetlands to open water. (IPCC, 2007). Tidal wetlands are generally found between sea level and the highest tide over the monthly lunar cycle. As a result, areas with small tide ranges are the most vulnerable. An http://epa.gov/climatechange/effects/coastal/appB.htmlEPA Report to Congress estimated that a two foot rise in sea level could eliminate 17-43 percent of U.S. wetlands, with more than half the loss taking place in Louisiana (EPA, 1989).



Nationwide, about 5000 square miles of dry land are within two feet of high tide. Although the majority of this land is currently undeveloped, many coastal counties are growing rapidly. Land within a few feet above the tides could be inundated by rising sea level, unless additional dikes and bulkheads are constructed. A two foot rise in sea level would eliminate approximately 10,000 square miles of land, including current wetlands and newly inundated dry land, an area equal to the combined size of Massachusetts and Delaware (EPA, 1989).

Some of the most economically important vulnerable areas are recreational resorts on the coastal barriers of the Atlantic and Gulf coasts. In many cases, the ocean-front block of these islands is 5 to 10 feet above high tide; but the bay sides are often less than two feet above high water and regularly flooded. Erosion threatens the high ocean sides of these densely developed islands and is generally viewed as a more immediate problem than inundation of their low bay sides. Many ocean shores are currently eroding 1 to 4 feet per year (FEMA, 2000).

Storms and Flooding

Sea level rise also increases the vulnerability of coastal areas to flooding during storms for several reasons. First, a given storm surge from a hurricane or northeaster builds on top of a higher base of water. Considering only this effect, a Report to Congress by FEMA (1991) estimated that existing development in the U.S. Coastal Zone would experience a 36-58 percent increase in annual damages for a 1-foot rise in sea level, and a 102-200 percent increase for a 3-foot rise. Shore erosion also increases vulnerability to storms, by removing the beaches and dunes that would otherwise protect coastal property from storm waves (FEMA 2000). Sea level rise also increases coastal flooding from rainstorms, because low areas drain more slowly as sea level rises.

Other impacts of climate change may further enhance or mitigate coastal flooding. Flooding from rainstorms may become worse if higher temperatures lead to increasing rainfall intensity during severe storms. An increase in the intensity of tropical storms would increase flood and wind damages.

Using the generalized mapping for sea level rise discussed in the above section it is estimated if a sea level rise of 6 feet were to occur approximately 71% of the City would be located in a flood hazard area.

Responses to Sea Level Rise along the Coast

Property owners and federal, state, and local governments are already starting to take measures to prepare for the consequences of rising sea level. Most coastal states are working with the U.S. Army Corps of Engineers to place sand onto their beaches to offset shore erosion. Property owners are elevating existing structures in many low-lying areas, encouraged by lower flood insurance rates.

Several states have adopted policies to ensure that beaches, dunes, or wetlands are able to migrate inland as sea level rises. Some states prohibit new houses in areas likely to be eroded in the next 30-60 years (e.g. North Carolina Coastal Resources Commission). Concerned about the need to protect property rights, Maine, Rhode Island, South Carolina and Texas have implemented some version of "rolling easements," in which people are allowed to build, but only on the condition that they will remove the structure if and when it is threatened by an advancing shoreline (Titus, 1998).

REPETITIVE LOSS PROPERTIES

A Repetitive Loss Structure is a structure that has suffered **flood** damage on two or more occasions during a 10-year period. These repetitive loss structures nationwide account for approximately 2% of the insured properties but have received over 40% of the claims paid. Utilizing data ending June 2008 in Portsmouth:

- There have been 800 claims for losses of $5,691,448.
- 170 claims were from repetitive loss properties.
- There are 60 parcels that were considered repetitive loss.
- The cost of repetitive losses totals $2,012,743.
- .15% of the total city parcels account for 35% of the flood damages or
- .8% of the city parcels in flood hazard districts account for 35% of the flood damages

Through 2008 60 properties are found in the following neighborhoods:

Neighborhood	properties	Neighborhood	properties
Brighton	2	Prentis Park	1
Century Homes	2	Simonsdale	4
Churchland	3	Southside	2
Cradock	6	Sterling Point	1
Green Acres	1	Truxtun	1
Olde Towne	20	Turnpike Corridor	2
Olde Towne South	1	Waterview	2
Oregon Acres	1	West Norfolk	1
Parkview	3	West Parkview	1
Pine Acres	1	Westhaven	4
Pinehurst	1		

This identification process enabled the City to continue with the following goals of the previous flood plain management plan. The goals listed below, should be considered as additional goals of this plan.

1. Identify the properties that are situated near repetitive loss structures and advise them of their increased at-risk status.
2. Identify the causes of the flooding and, as funding is available, address solutions that provide the highest return.

3. Notify the property owners of new programs that may reduce their at-risk status as they become available.

The following flood planning programs will address each of these goals with a range of activities, which will improve general public information on the various aspects of flood prevention and mitigation. In addition this section will increase the level of regulatory review in regards to existing development in the repetitive loss portions of the floodplains, and provide and various public improvements, which will lessen future flood damage.

In late June of 2010 the City of Portsmouth received a listing of the repetitive loss properties that through June 1, 2010 had claims paid for the 2009 Nor'easter. This storm alone caused the number of repetitive loss structures to increase from 60 properties to 181 properties. The following is a listing of the neighborhoods that has repetitive loss properties:

Olde Towne	65
Westhaven	25
Cradock	15
Simonsdale	9
Port Norfolk	8
Park View	7
Oregon Acres	7
Pinehurst/Green Acres	6
Brighton	6
West Park View	5
Swimming Point	4
Wise Beach	4
Waterview	3
Pine Acres	2
Truxtun	2
West Norfolk	1
Sterling point	1
Turnpike Corridor	1
Prentis Park	1
Cedar Point	1
Prentis Place	1
Park Manor	1
Westbury	1
Olde Towne South	1
Not in a neighborhood	4

While exact dollar figures are not currently available for this storm the statewide average for all claims exceeded $15,500 per claim.

One major modification that has occurred within the past year that will assist in reducing the number of repetitive loss structure in the future is the modification of the definition of "Substantial Damage". This new code requirement now reads,

"**Substantial damage** means damage of any origin sustained by a structure when the cost of restoring the structure to its pre-damage condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. ***A structure that has been damaged 2 or more times during any consecutive 10 year period with a cumulative building loss equal to or exceeding 50 percent of the assessed building value shall also be considered a substantial damaged structure."*** Through the use of this new definition substantial damaged structures may now be addressed in a more comprehensive manner that at any time in the past.

Maps of the repetitive loss areas are included in the Appendix. Because of confidentiality regulations, a listing of the specific properties and their claims cannot be published.

SEVERELY REPETITIVE LOSS STRUCTURES

The definition of severe repetitive loss (SRL) as applied to this program was established in section 1361A of the National Flood Insurance Act, as amended (NFIA), 42 U.S.C. 4102a. A SRL property is defined as a **residential property** that is covered under an NFIP flood insurance policy and:

(a) That has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or

(b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.

The Severe Repetitive Loss (SRL) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which amended the National Flood Insurance Act of 1968 to provide funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) structures insured under the National Flood Insurance Program (NFIP).

Purpose: To reduce or eliminate claims under the NFIP through project activities that will result in the greatest savings to the National Flood Insurance Fund (NFIF).

Federal / Non-Federal cost share: 75 / 25 %; up to 90 % Federal cost-share funding for projects approved in States, Territories, and Federally-recognized Indian tribes with FEMA-approved Standard or Enhanced Mitigation Plans or Indian tribal plans that include a strategy for mitigating existing and future SRL properties.

Should the City of Portsmouth participate in a grant to reduce the number of Sever Repetitive Loss Structures and the property owner declines participation of the Mitigation Offer of Assistance, FEMA will issue a Notice of NFIP Insurance Premium Rate Increase to the property owner specifying the effective date of the insurance premium rate increase for the property. Generally, this increase will occur upon renewal of the insurance policy.

Currently there are eight (8) SRL properties in the City of Portsmouth. Four (4) are located in the Olde Towne Neighborhood and two in the Cradock neighborhood one in the Waterview neighborhood and one in an area that does not have a specific neighborhood.

5. SET GOALS

Floodplain Management Plan Goals

The overriding goals of the floodplain management plan can be summarized in the following statements:

1. Protect citizens from the life threatening hazards associated with flooding
2. Protect public and private property from damage relating to flooding
3. Provide for optimal use and enjoyment of public and private property while maintaining the greatest level of flood protection possible

The floodplain management plan will address each of these goals with a range of activities, which will improve general public information on the various aspects of flood prevention and mitigation, increase the level of regulatory review in regard to new development in floodplains, and provide the various public improvements, which will lessen future flood damage.

Planning Factors


Photo courtesy of the Virginian Pilot

Portsmouth is a developed city with very little vacant buildable land. It has been estimated that approximately 94-96% of the developable land has been built upon. Consequently, future development in the city will likely be through infill of scattered vacant lots and the redevelopment of small geographic areas as market forces dictate. Because of Portsmouth's substantial port facilities, both military and cargo, waterfront development along the deep channels of the Elizabeth River will be maintained and in some cases expanded.

Given the importance of port functions to the city, the general development pattern in place, and the recreational and economic needs for waterfront access, it is apparent that a majority of the activities to take place regarding floodplain management will revolve around mitigating flood losses and hazards to existing development. This could include requirements that development meets upgraded floodplain regulations, and instituting programs and projects that will reduce flood hazards throughout the city.


High Street Landing during Hurricane Isabel

There may be opportunities for acquiring land in floodplains for public recreational use over time, but acquisition will not be a primary floodplain management activity due to the expense of purchasing developed properties. However, the plan will encourage protecting and maintaining ownership of undeveloped public lands that are in floodplains so that future development will not occur on these properties. In the same way, because recreational use of the waterfront has been established and will be maintained as a city policy, flood protection activities that close the waterfront from public access, such as floodwalls or other structures, are not considered viable options at this time. It is a more attractive option to devise projects and programs that provide adequate flood protection while allowing public access and use of the waterfront. The following outlines the overall goals that will shape Portsmouth's floodplain management plan.

General

1. Include floodplain mitigation in Comprehensive Plan update
2. Include floodplain mitigation actions as a budget consideration
3. Include floodplain mitigation actions as a component of the overall Emergency Preparedness Plan

Economic Development

1. Maintain physical and visual links between downtown and the waterfront.
2. Develop all aspects of the maritime sector.
3. Encourage development of smaller scale waterfront activities on lesser channels

Housing

1. Insure high-quality design and construction in new housing built in the city
2. Insure that all repairs and additions are in compliance with the National Flood Insurance Program requirements
3. Advise property owners in the proper method for the selection of a contractor

Environmental Quality

1. Protect, enhance, restore and manage wetlands, beaches, sand dunes, forests and other ecosystems including remaining waterfowl and wildlife habitats
2. Improve and maintain public access to city waterways including public beaches, parks and other natural areas

3. Develop, promote and manage a greenway and open space preservation program throughout the city, which provides protection to open space and environmentally sensitive areas
4. Manage a flood protection program for those areas threatened by the potential of damaging floodwaters
5. Coordinate the production and distribution of educational materials for the general public dealing with environmental issues

6. DRAFT AN ACTION PLAN

Floodplain Management Plan

In the City of Portsmouth's initial plan the floodplain management action items were organized around the three basic components: public information, mapping and regulatory review, and flood damage prevention and reduction. For each of these components an overall goal was presented, which was supported by a series of policy statements. Along with these policy statements, various activities were listed that, when implemented, contributed to the implementation of the policy. These activities, including timetable and estimated budgetary impacts, were listed with each policy under the heading "Items to Accomplish". The 2010 plan will be divided into 3 main sections, Past Accomplishments, Continuing Actions and Future Dreams, which are much different in format but similar to the initial plan by providing a roadmap to better flood plain management.

Past Accomplishments

A true method to grade a plan is through the comparison of its action items to accomplishments. Through the diligent efforts of many City departments the initial Flood Plan guided Portsmouth to a point where it was recognized as a leader in flood plain management by its progressive actions even when facing numerous obstacles. The following is a listing of the major accomplishments of that plan:

1. Staff prepared and updated an interactive map on the City's web site that allowed citizens 24 hour access. The mapping application includes:, current and past flood zones, elevation contours from 0 to 8 feet, surge analysis for category 1 though 4 storms, and Chesapeake Bay districts.
2. Obtained new Flood Insurance Rate Maps from F.E.M.A. on September 25, 2009
3. Adopted new flood plain regulations that:

a. Provided Freeboard requirements
b. Created a new definition for substantial damage to facilitate insurance claims and reduce future claims
c. Prohibit storage materials from being stored in flood hazard zones.

4. Prepared comprehensive Repetitive Loss Area maps.
5. Updated the Chesapeake Bay regulations to improve coordination with the Floodplain regulations.

Floodplain Management Plan Continuing Actions

One very clear result of the initial plan was that many activities needed to be completed in a systematic manner each year. Only through the listing and periodic review and discussion of these activities will the everyday floodplain management issues be improved and continued. The following are those activities that have been identified as needing to continue on a regular basis:

Actions

1. Prepare or obtain pamphlets for distribution
2. Determine which public fairs and festivals should be targeted for staff participation and information distribution
3. Attend Civic League meetings in areas of potential flood hazard and present flood related information
4. Obtain updated mailing lists for properties covered by flood insurance or having filed flood damage claims and distribute information by mail.
5. Obtain updated maps for properties located in the Flood Hazard Areas and notify owners/residents of location and potential for damage and availability of Flood Insurance.
6. Distribute flood hazard related information to the general public through various means to include postcards, electronic billboards, and notices in utility bills
7. Continue stocking the library system with flood related books and publicize the activity
8. Notify Real Estate Community, Lending Institutions, and Insurance Companies of participation in the National Flood Insurance Program and Community Rating System Program.
9. Complete an emergency evacuation plan under the auspices of the Department of Emergency Services with input from VDOT and with adoption by City Council.
10. Review plans for all new construction to insure they meet or exceed the requirements of state federal and local regulations.
11. Keep interactive map on the City's web site up-to-date as conditions and circumstances change and as regulations affecting mapping of floodplains change.
12. Modify mapping to fit a format to be included on the City of Portsmouth Flood Preparedness Web Page.
13. Provided staff training on the

requirements of the National Flood Insurance Program, local floodplain regulations, elevation certificates, flood vents, substantial damage and substantial improvement,

14. Identify and fund drainage improvement projects
15. Continue to identify all repetitive loss structures with in the city.
16. Continue to notify all repetitive loss structures of status and the potential of becoming a substantially damaged structure with the next event.
17. Review Repetitive Loss areas and identify new repetitive loss properties, sources of flooding and potential mitigation strategies.
18. Provide the necessary maintenance to the storm drain system to reduce the potential of flooding from rain or storm events
19. Increase the educational activities to all citizens of the potential and effects of flooding in the city

Floodplain Management Plan Future Actions

"Mitigation, a cornerstone of emergency management, is defined as taking sustained actions to reduce or eliminate the long-term risks to people and property from hazards. Mitigation builds community resilience and community sustainability." When a tornado or flood is upon us, it is too late to take mitigative actions; but by taking steps to lower our risk across generations, we can ensure that our communities recover more quickly from those natural events when they do occur. Building our homes and buildings outside of high-risk flood areas; fortifying our schools and hospitals and office buildings against earthquakes; constructing safe rooms for our neighbors, our friends, and our families to shelter in during high wind events are all examples of ways planners, developers, architects, engineers, and community leaders can take those necessary and sustainable actions to protect existing and future development against natural functions of the environment and reduce the need—and cost—for response and recovery after an event occurs." (Hazard Mitigation: Integrating Best Practices into Planning)

Utilizing the comment, concerns from citizens during the June 29th Public Meeting, the CRS Task Force and staffs concerns during numerous internal meetings, the following actions for the future are included in the plan. Each of these items is to be accomplished as funds are made available.

Short term Actions (to occur within the next 2 to 5 years as funding is available)

1. Protect water and sewer utility system from damage and interruption of services due to flood damages.
    a. Raise the power outlet and meter stand at 2501 Sterling Point Drive to an elevation of 9.5 on the 1988 NAVD
    b. Locate other city owned power outlet and meter stands and raise to an elevation of 9.5 on the 1988 NAVD.
    c. Raise all generators for water and sewage pumping stations to an elevation of 9.5 on the 1988 NAVD
2. Prepare an education segment to be aired on the City Channel 48 during the hurricane and Nor'easter storm season.

3. Compile a list of inexpensive steps homeowners can take to reduce flood damage.
4. Once the Storm Drainage study is complete and adopted by City Council, include the report, recommendations and actions into this document's appendix.
5. Map streets that routinely flood during rain events. Identify the cause of the flooding and develop measures that reduce the flooding.
6. Map streets that would be affected by storm surges and develop measures that reduce the flooding.
7. Determine, based on current information an expected sea level rise for the next 100 years.
8. Prepare infrastructure plans utilizing sea level rise as a determining and budget factor.
9. Prepare a grant application to address severely repetitive loss structures.
10. Review "Best Practices" of other communities to remain abreast of current floodplain management activities.

11. Map commercial operations that store hazardous materials and that are in the flood hazard areas.
12. Prepare evacuation policies that include actions for disabled individuals.
13. Require all requests for homes for the aged, nursing homes, homes for disabled and the like to have an emergency operations plan.

Long Term Actions (to occur within the 5 to 10 years as funding is available)

1. Prepare a repetitive loss strategy to address flooding condition in all repetitive loss neighborhoods
2. Increase the ability of the school system to provide shelters/temporary housing for flood victims
3. Provide protection from surge flooding for the downtown, Olde Towne, Westhaven and Cradock sections of the city
4. Continue with existing storm drainage evaluation and planning currently underway under the direction of the City Engineer.
5. Implement measures that reduce street flooding during rain events.
6. Identify and fund drainage improvement projects.
7. On a five year basis determine the rate of sea level rise using the most accurate information available and amend plans accordingly.
8. Prepare and adopt an overlay zoning district that addresses concerns of sea level rise

7. ADOPT THE PLAN

A RESOLUTION ADOPTING A REVISED FLOODPLAIN MANAGEMENT PLAN FOR THE CITY OF PORTSMOUTH, VIRGINIA.

WHEREAS, in order to remain a participating member of the National Flood Insurance Program's Community Rating System Program, a floodplain management plan must be adopted by the governing body of the participating member locality and updated every five years; and

WHEREAS, the City's Comprehensive Plan also identifies the need to "continue to participate in the National Flood Insurance Program, enforce the Floodplain Ordinance, and pursue policies to minimize the risks of flood damages;" and

WHEREAS, the City Council originally adopted a Floodplain Management Plan on September 13, 2005, and

WHEREAS, in compliance with the federal floodplain management plan revision requirement, the City Council received a presentation concerning the purpose for the Plan revision and the proposed schedule on May 24, 2010; and

WHEREAS, after a two month-long period of public comment that involved two public meetings, notification to civic leagues in the City, access to the Plan and the ability to comment on the internet, by mail, and at the public meetings and the City Council public hearing, a revised Floodplain Management Plan has been prepared in response to the comments received from the public, the Hampton Roads Planning District Commission, , the Virginia Department of Conservation and Recreation, and the Army Corps of Engineers.

NOW THEREFORE BE IT RESOLVED by the Council of the City of Portsmouth, Virginia that it hereby approves and adopts the above-referenced revised Flood Management Plan.

BE IT FURTHER RESOLVED that the City Manager is authorized and directed to take such additional measures as may be required to continue the City's membership in the National Flood Insurance Program's Community Rating System Program.

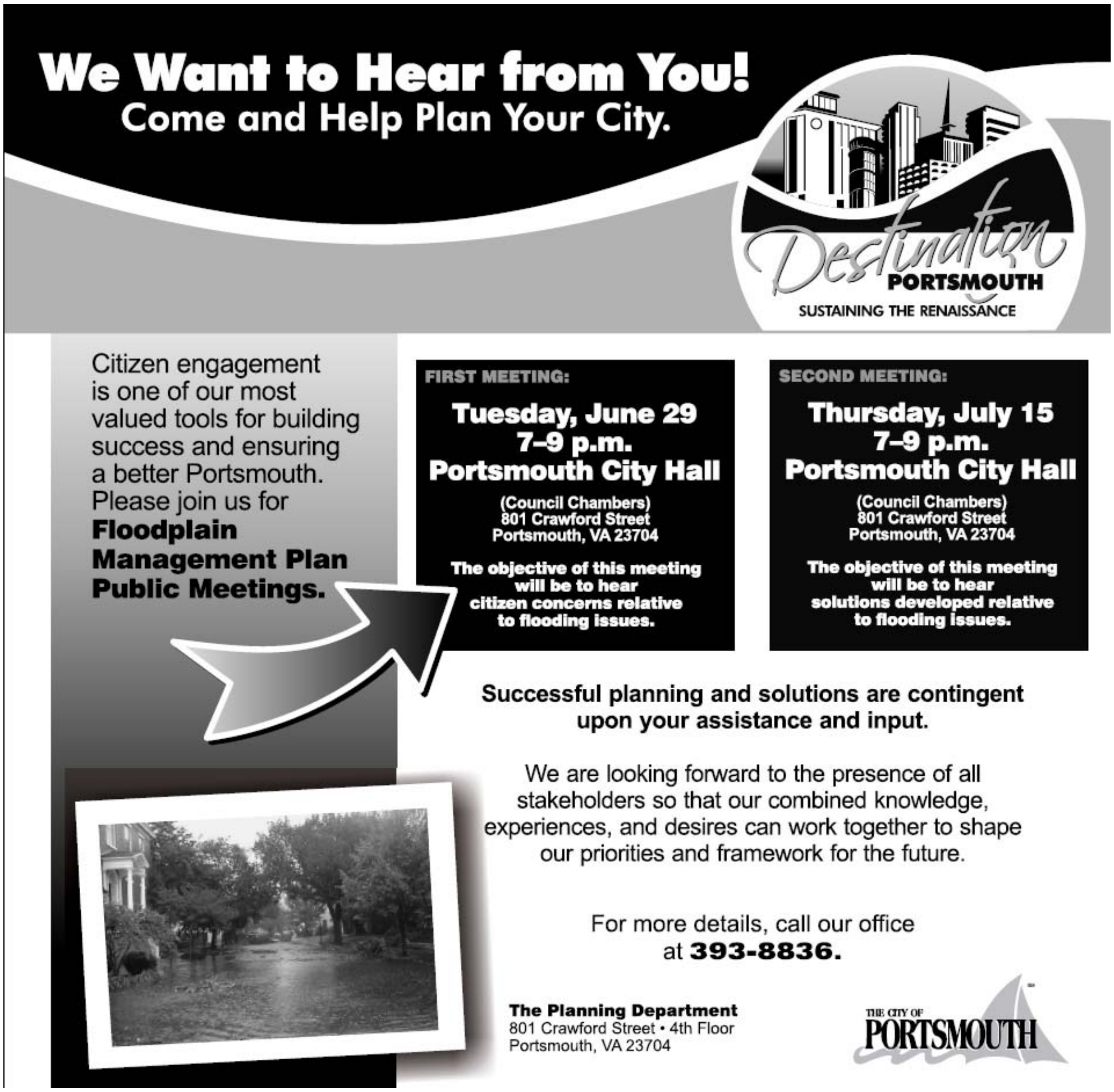
ADOPTED by the Council of the City of Portsmouth, Virginia at a meeting held on October 12, 2010.

Teste:

City Clerk

Appendix

A. Newspaper Ad of June 20 and June 27, 2010 (full page Virginian Pilot Currents Section)



B. The Post Cards Mailed for Public Meetings

We Want to Hear from You!

Come and Help Plan Your City.

Citizen engagement is one of our most valued tools for building success and ensuring a better Portsmouth. Please join us for **Floodplain Management Plan Public Meetings.**

Tuesday, June 29 • 7–9 p.m.
Portsmouth City Hall
(Council Chambers)
801 Crawford Street • Portsmouth, VA 23704
The objective of this meeting will be to hear citizen concerns relative to flooding issues.

Thursday, July 15 • 7–9 p.m.
Portsmouth City Hall
(Council Chambers)
The objective of this meeting will be to present solutions developed relative to flooding issues.

Successful planning is contingent upon your assistance and input.

We are looking forward to the presence of all stakeholders so that our combined knowledge, experiences, and desires can work together to shape our priorities and framework for the future.

For more details, please call the Planning Department at **393-8836.**

THE CITY OF PORTSMOUTH

The Planning Department
801 Crawford Street • 4th Floor
Portsmouth, VA 23704

PRESORTED
First Class Mail
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Permit No. 16

C. The Hurricane History of Coastal Virginia

Continuous weather records for the Hampton Roads Area of Virginia began on January 1, 1871 when the National Weather Service was established in downtown Norfolk. The recorded history of significant tropical storms that affected the area goes back much further. Prior to 1871, very early storms have been located in ship logs, newspaper accounts, history books, and countless other writings. The residents of coastal Virginia during Colonial times were very much aware of the weather. They were a people that lived near the water and largely derived their livelihood from the sea. To them, a tropical storm was indeed a noteworthy event. The excellent records left by some of Virginia's early settlers and from official records of the National Weather Service are summarized below. Learning from the past will help us prepare for the future.

Seventeenth and Eighteenth Centuries

1635 August 24

First historical reference to a major hurricane that could have affected the Virginia coast.

1667 September 6

It appears likely this hurricane caused the widening of the Lynnhaven River. The Bay rose 12 feet above normal and many people had to flee.

1693 October 29

From the Royal Society of London: "There happened a most violent storm in Virginia which stopped the course of ancient channels and made some where there never were any."

1749 October 19

Tremendous hurricane. A sand spit of 800 acres was washed up and with the help of a hurricane in 1806 it became Willoughby Spit. The Bay rose 15 feet above normal.

Historical records list the following tropical storms as causing significant damage in Virginia: September 1761; October 1761; September 1769; September 1775; October 1783; September 1785; July 1788.

Nineteenth Century

1806 August 23

Called the Great Coastal Hurricane of 1806.

1821 September 3

One of the most violent hurricanes on record.

1846 September 8

Hatteras and Oregon Inlets were formed.

1876 September 17
Average 5 minute wind speed at Cape Henry was 78 mph; 8.32" of rain

1878 October 23
Cobb and Smith Islands, on the Eastern Shore, were completely submerged. Average 5 minute wind at Cape Henry was 84 mph. Eighteen died when the A.S. Davis went ashore near Virginia Beach.

1879 August 18
Tide in Norfolk 7.77 feet above Mean Lower Low Water. Average 5 minute wind speed at Cape Henry 76 mph with 100 mph estimated gusts.

1887 October 31
Average 5 minute wind speed at Cape Henry 78 mph. The storm caused a record number of marine disasters.

1893 August 23
Average 5 minute wind speed at Cape Henry 88 mph.

1894 September 29
Five minute wind speed at Cape Henry 80 mph; gusts to 90 mph.

1897 October 25
Lasted **60 hours**. Norfolk tides 8.1 feet above Mean Lower Low Water.

1899 October 31
Average 5-minute wind at Cape Henry 72 mph. Tide in Norfolk reached 8.9 feet above Mean Lower Low Water.

Noteworthy storms also occurred in June 1825, August 1837, August 1850 and September 1856.

Twentieth Century

1903 October 10
Average 5 minute wind speed at Cape Henry 74 mph, the tide in Norfolk reached 9 feet above Mean Lower Low Water.

1924 August 26
Average 1 minute wind speed 72 mph at Cape Henry.

1924 September 30
Fastest 1 minute wind speed in Norfolk 76 mph.

1926 August 22
Fastest 1 minute wind speed in Cape Henry 74 mph.

1928 September 19

Fastest 1 minute wind speed at Cape Henry 72 mph. The tide reached 7.16 feet above Mean Lower Low Water in Norfolk.

1933 August 23

This hurricane established record high tide of 9.8 feet above Mean Lower Low Water. 18 people died. Highest 1 minute wind speed in Norfolk was 70 mph, 82 mph at Cape Henry, and 88 mph at NAS, Norfolk.

1933 September 16

Fastest 1 minute wind speed was 88 mph at Naval Air Station, Norfolk, 75 mph at the NWS City Office, and 87 mph at Cape Henry. The tide reached 8.3 feet above Mean Lower Low Water.

1936 September 18

The fastest 1 minute wind speed was 84 mph at Cape Henry and 68 mph at the NWS City Office. The tide reached 9.3 feet above Mean Lower Low Water and is the second highest tide of record.

1944 September 14

Fastest 1 minute wind speed was 134 mph at Cape Henry, which is the highest speed of record in this area. Gusts were estimated to 150 mph. The NWS City Office recorded 72 mph with gusts to 90 mph.

1953 August 14

Barbara. The fastest 1 minute wind speed was 72 mph at Cape Henry, 63 mph with gusts to 76 mph at Norfolk Airport.

1954 October 15

Hazel. Fastest 1 minute wind speed was 78 mph at Norfolk Airport with gusts to 100 mph, which is the highest wind speed of record for the Norfolk Airport location. A reliable instrument in Hampton recorded 130 mph.

1959 September 30

Gracie. Passed through western Virginia, 6.79 inches of rain at Norfolk Airport in 24 hours. Storm spawned a tornado eight miles west of Charlottesville, killing 11 people.

1960 September 12

Donna. Fastest 1 minute wind speed was 73 mph at Norfolk Airport, 80 mph at Cape Henry and estimated 138 mph at Chesapeake Light Ship. Lowest pressure of 28.65 inches holds the area record for a tropical storm. Three deaths.

1964 September 1

Cleo. A storm noted for its rain. 11.40 inches in 24 hours is the heaviest in the coastal area since records began in 1871.

1969 August 19
Camille. Made landfall in Mississippi on August 17. The storm tracked northward and dumped a record 27 inches of rain in the Virginia mountains, primarily in Nelson County. Flash flooding took the lives of 153 people.

1971 August 27
Doria. The fastest 1 minute wind speed 52 mph at Norfolk Airport and 71 mph at Naval Air Station, Norfolk.

1972 June 21
Agnes. Made landfall on the Gulf Coast of Florida. As the storm crossed Virginia, it dumped 13.6 inches of rain on the east slopes of the Blue Ridge Mountains. The James River crested at a record high in Richmond. Virginia sustained $222 million in damage, and 13 people died from flash flooding.

1979 September 5
David. Passed through central Virginia. Spawned 2 severe tornadoes - one in Newport News with over $2 million in damage and one in Hampton with a half million dollars in damage.

1985 September 27
Gloria. Passed 45 miles east of Cape Henry. Fastest 1 minute wind speed WNW 46 mph, peak gust 67 mph at the Airport, NE 94 mph gust to 104 mph at the South Island Chesapeake Bay Bridge-Tunnel. Highest tide 5.3 feet above Mean Lower Low Water, storm rainfall 5.65 inches and total Virginia damage $5.5 million.

1986 August 17
Charley. The weak center passed over southeast Virginia Beach. Fastest 1 minute wind speed NNE 40 mph gust E 63 mph at Norfolk International Airport; NE 94 mph gust to 104 mph at South Island Chesapeake Bay Bridge-Tunnel; and NE 54 mph gust to 82 mph at Cape Henry. Highest tide 5.5 feet above MLLW. Less than $1 million in damage in Virginia.

1996 July 12-13
Bertha. Passed over portions of Suffolk and Newport News. Fastest 1 minute wind speed SE 35 mph gust to 48 mph at Norfolk International Airport. Bertha spawned four tornadoes across east-central Virginia. The strongest, an F1 tornado, moved over Northumberland County injuring nine persons and causing damages of several million dollars. Other tornadoes moved over Smithfield, Gloucester and Hampton.

1996 September 5
Fran. Passed well west of the area over Danville. Fastest 1 minute wind speed SE 41 mph gust to 47 mph at Norfolk International Airport. Rainfall amounted to only 0.20 of an inch In Norfolk.

1998 August 27
Bonnie. Tracked over the northern Outer Banks. Fastest 1 minute wind speed NE 46 mph with gust to 64 mph at Norfolk Airport. NE 90 mph with gust to 104 mph at Chesapeake Bay Bridge-Tunnel. 4-7 inches of rain combined with near hurricane-force winds knocked out power to 320,000 customers. Highest tide 6.0 feet above MLLW. Most significant storm since 1960.

1999 August 30 -
September 5
Dennis. Produced one of the most prolonged periods of tropical storm conditions in eastern Virginia. Fastest 1 minute wind speed NE 43 mph with gust to 53 mph at Norfolk Int'l Airport. Storm total rainfall 3.30 inches. Significant beach erosion reported.

1999 September 15-16
Floyd. Passed directly over Virginia Beach on a track similar to Hurricane Donna in 1960. Lowest pressure of 28.85" (977 MB) at Norfolk International Airport fourth lowest for a hurricane this century. Fastest 1 minute wind NE 31 mph with gust to 46 mph. Rainfall 6.80 inches with amounts of 12-18 inches in interior portions of eastern Virginia. Franklin, Virginia reported 500 year flood of record. Largest peacetime evacuation in U.S. history.

Twenty-first Century

2003 September 18
Isabel. Made landfall near Ocracoke North Carolina. The center passed west of Emporia and west of Richmond. Fastest 1 minute wind speed NE 54 mph with gusts to 75 mph at Norfolk NAS; NE 61 mph with gusts to 74 mph at the South Island Chesapeake Bay Bridge-Tunnel. Highest tide at Sewells Point was 7.9 feet above MLLW, which was a 5 foot surge. Significant beach erosion was reported. Numerous trees and power lines down over a wide area, with over 2 million households without power in Virginia. Virginia damage was over $625 million, and there were over 20 deaths in Virginia.

2009 November 11-15

Virginia Gov. Timothy M. Kaine (D) declared a state of emergency Wednesday November 11th, authorizing state and local agencies to take necessary precautions against coastal flooding as the state is walloped simultaneously by a coastal northeaster and the remnants of Tropical Storm Ida. The Virginia State Police reported 141 accidents in the Hampton Roads area since the rain and wind arrived. The James River Bridge and the Midtown Tunnel (between Norfolk and Portsmouth) were closed, and the Jamestown-Scotland ferries stopped operation after high water flooded the loading ramps.

Winds were gusting to 60 mph by late Wednesday afternoon at the Chesapeake Bay Bridge-Tunnel, which spans the bay's mouth, but cars and pickup trucks were being allowed to make the 20-mile crossing.

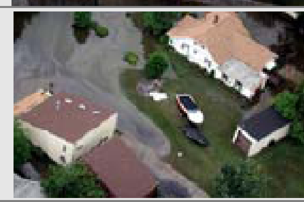
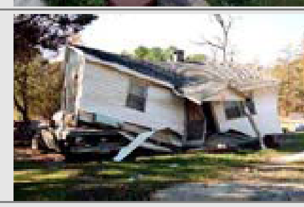
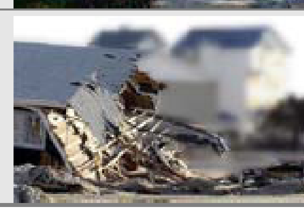
Flooding occurred in many Portsmouth neighborhoods as the north east wind pushed tidal waters to levels that equal or exceeded those recorded during hurricane Isabel in 2003.

Hurricanes come close enough to produce hurricane force winds approximately three times every 20 years. Two or three times a century winds and tides produce considerable damage and significantly threaten life. Three known storms have been powerful enough to alter coastal features.

MLLW = Mean Lower Low Water, which is the mean of the lowest of the low tide values

D. Saffir-Simpson Hurricane Scale

The two depictions of the Saffir-Simpson shown in this section are provide to detail the full effects of a hurricane on buildings and trees.

STORM CATEGORY	DAMAGE LEVEL	DESCRIPTION OF DAMAGES	PHOTO EXAMPLE
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage.	
2	MODERATE	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings.	
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland.	
4	EXTREME	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.	
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.	

National Hurricane Center and the Federal Emergency Management Agency

Category One Hurricane (Sustained winds 74-95 mph, 64-82 kt, or 119-153 km/hr). *Very dangerous winds will produce some damage* People, livestock, and pets struck by flying or falling debris could be injured or killed. Older (mainly pre-1994 construction) mobile homes could be destroyed, especially if they are not anchored properly as they tend to shift or roll off their foundations. Newer mobile homes that are anchored properly can sustain damage involving the removal of shingle or metal roof coverings, and loss of vinyl siding, as well as damage to carports, sunrooms, or lanais. Some poorly constructed frame homes can experience major damage, involving loss of the roof covering and damage to gable ends as well as the removal of porch coverings and awnings. Unprotected windows may break if struck by flying debris. Masonry chimneys can be toppled. Well-constructed frame homes could have damage to roof shingles, vinyl siding, soffit panels, and gutters. Failure of aluminum, screened-in, swimming pool enclosures can occur. Some apartment building and shopping center roof coverings could be partially removed. Industrial buildings can lose roofing and siding especially from windward corners, rakes, and eaves. Failures to overhead doors and unprotected windows will be common. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. There will be occasional damage to commercial signage, fences, and canopies. Large branches of trees will snap and shallow rooted trees can be toppled. Extensive damage to power lines and poles will likely result in power outages that could last a few to several days. Hurricane Dolly (2008) is an example of a hurricane that brought Category 1 winds and impacts to South Padre Island, Texas.

Category Two Hurricane (Sustained winds 96-110 mph, 83-95 kt, or 154-177 km/hr). *Extremely dangerous winds will cause extensive damage* There is a substantial risk of injury or death to people, livestock, and pets due to flying and falling debris. Older (mainly pre-1994 construction) mobile homes have a very high chance of being destroyed and the flying debris generated can shred nearby mobile homes. Newer mobile homes can also be destroyed. Poorly constructed frame homes have a high chance of having their roof structures removed especially if they are not anchored properly. Unprotected windows will have a high probability of being broken by flying debris. Well-constructed frame homes could sustain major roof and siding damage. Failure of aluminum, screened-in, swimming pool enclosures will be common. There will be a substantial percentage of roof and siding damage to apartment buildings and industrial buildings. Unreinforced masonry walls can collapse. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. Commercial signage, fences, and canopies will be damaged and often destroyed. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks. Potable water could become scarce as filtration systems begin to fail. Hurricane Frances (2004) is an example of a hurricane that brought Category 2 winds and impacts to coastal portions of Port St. Lucie, Florida with Category 1 conditions experienced elsewhere in the city.

Category Three Hurricane (Sustained winds 111-130 mph, 96-113 kt, or 178-209 km/hr). *Devastating damage will occur* There is a high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. Most newer mobile homes will sustain severe damage with potential for complete roof failure and wall collapse. Poorly constructed frame homes can be destroyed by the removal of the roof and exterior walls. Unprotected windows will be broken by flying debris. Well-built frame homes can experience major damage involving the removal of roof decking and gable ends. There will be a high percentage of roof covering and siding damage to apartment buildings and industrial buildings. Isolated structural damage to wood or steel framing can occur. Complete failure of older metal buildings is possible, and older unreinforced masonry buildings can collapse. Numerous windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Most commercial signage, fences, and canopies will be destroyed. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to a few weeks after the storm passes. Hurricane Ivan (2004) is an example of a hurricane that brought Category 3 winds and impacts to coastal portions of Gulf Shores, Alabama with Category 2 conditions experienced elsewhere in this city.

Category Four Hurricane (Sustained winds 131-155 mph, 114-135 kt, or 210-249 km/hr). *Catastrophic damage will occur* There is a very high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. A high percentage of newer mobile homes also will be destroyed. Poorly constructed homes can sustain complete collapse of all walls as well as the loss of the roof structure. Well-built homes also can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Extensive damage to roof coverings, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will break most unprotected windows and penetrate some protected windows. There will be a high percentage of structural damage to the top floors of apartment buildings. Steel frames in older industrial buildings can collapse. There will be a high percentage of collapse to older unreinforced masonry buildings. Most windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months. Hurricane Charley (2004) is an example of a hurricane that brought Category 4 winds and impacts to coastal portions of Punta Gorda, Florida with Category 3 conditions experienced elsewhere in the city.

Category Five Hurricane (Sustained winds greater than 155 mph, greater than 135 kt, or greater than 249 km/hr).

Catastrophic damage will occur
People, livestock, and pets are at very high risk of injury or death from flying or falling debris, even if indoors in mobile homes or framed homes. Almost complete destruction of all mobile homes will occur, regardless of age or construction. A high percentage of frame homes will be destroyed, with total roof failure and wall collapse. Extensive damage to roof covers, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will occur to nearly all unprotected windows and many protected windows. Significant damage to wood roof commercial buildings will occur due to loss of roof sheathing. Complete collapse of many older metal buildings can occur. Most unreinforced masonry walls will fail which can lead to the collapse of the buildings. A high percentage of industrial buildings and low-rise apartment buildings will be destroyed. Nearly all windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Nearly all trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months. Hurricane Andrew (1992) is an example of a hurricane that brought Category 5 winds and impacts to coastal portions of Cutler Ridge, Florida with Category 4 conditions experienced elsewhere in south Miami-Dade County.

Remember that the arrival of a storm center is preceded by strong winds and rain several hours before landfall.

E. Worldwide Tropical Hurricane Names

Experience shows that the use of short, distinctive given names in written as well as spoken communications is quicker and less subject to error than the older more cumbersome latitude-longitude identification methods. These advantages are especially important in exchanging detailed storm information between hundreds of widely scattered stations, coastal bases, and ships at sea.
Since 1953, Atlantic tropical storms have been named from lists originated by the National Hurricane Center and now maintained and updated by an international committee of the World Meteorological Organization. The lists featured only women's names until 1979, when men's and women's names were alternated. Six lists are used in rotation. Thus, the 2004 list will be used again in 2010.

Atlantic Storm Names

2010 Hurricane Names:

Alex	Hermine	Otto
Bonnie	Igor	Paula
Colin	Julia	Richard
Danielle	Karl	Shary
Earl	Lisa	Tomas
Fiona	Matthew	Virginie
Gaston	Nicole	Walter

2011 Hurricane Names:

	Irene,	Philippe,
Arlene,	Jose,	Rina,
Bret, Cindy,	Katia,	Sean,
Don,	Lee,	Tammy,
Emily,	Maria,	Vince,
Franklin,	Nate,	Whitney
Gert, Harvey,	Ophelia,	

2012 Hurricane Names:

	Helene	Patty
Alberto	Isaac	Rafael
Beryl	Joyce	Sandy
Chris	Kirk	Tony
Debby	Leslie	Valerie
Ernesto	Michael	William
Florence	Nadine	
Gordon	Oscar	

2013 Hurricane Names:

	Gabrielle	Noel Olga
Andrea	Humberto	Pablo
Barry	Ingrid	Rebekah
Chantal	Jerry	Sebastien
Dean	Karen	Tanya
Erin	Lorenzo	Van
Felix	Melissa	Wendy

2014 Hurricane Names:

	Hanna	Paloma
Arthur	Ike	Rene
Bertha	Josephine	Sally
Cristobal	Kyle	Teddy
Dolly	Laura	Vicky
Edouard	Marco	Wilfred
Fay	Nana	
Gustav	Omar	

Here is more information on the history of naming hurricanes. The only time that there is a change in the list is if a storm is so deadly or costly that the future use of its name on a different storm would be inappropriate for reasons of sensitivity. If that occurs, then at an annual meeting by the WMO committee (called primarily to discuss many other issues) the offending name is stricken from the list and another name is selected to replace it

F. Definitions

ADVISORY: Official information issued by tropical cyclone warning centers describing all tropical cyclone watches and warnings in effect along with details concerning tropical cyclone locations, intensity and movement, and precautions that should be taken. Advisories are also issued to describe: (a) tropical cyclones prior to issuance of watches and warnings and (b) subtropical cyclones.

BEST TRACK: A subjectively-smoothed representation of a tropical cyclone's location and intensity over its lifetime. The best track contains the cyclone's latitude, longitude, maximum sustained surface winds, and minimum sea-level pressure at 6-hourly intervals. Best track positions and intensities, which are based on a post-storm assessment of all available data, may differ from values contained in storm advisories. They also generally will not reflect the erratic motion implied by connecting individual center fix positions.

CENTER: Generally speaking, the vertical axis of a tropical cyclone, usually defined by the location of minimum wind or minimum pressure. The cyclone center position can vary with altitude. In advisory products, refers to the center position at the surface.

CENTER / VORTEX FIX: The location of the center of a tropical or subtropical cyclone obtained by reconnaissance aircraft penetration, satellite, radar, or synoptic data.

CENTRAL NORTH PACIFIC BASIN: The region north of the Equator between 140W and the International Dateline. The Central Pacific Hurricane Center (CPHC) in Honolulu, Hawaii is responsible for tracking tropical cyclones in this region.

CLOSEST POINT OF APPROACH: Point where hurricane eye makes closest contact to shore without making landfall.

COASTAL FLOOD WARNING: A warning that significant wind-forced flooding is to be expected along low-lying coastal areas if weather patterns develop as forecast.

COASTAL FLOOD WATCH: An alert that significant wind-forced flooding is to be expected along low-lying coastal areas if weather patterns develop as forecast.

CYCLONE: An atmospheric closed circulation rotating counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

DIRECT HIT: A close approach of a tropical cyclone to a particular location. For locations on the left-hand side of a tropical cyclone's track (looking in the direction of motion), a direct hit occurs when the cyclone passes to within a distance equal to the cyclone's radius of maximum wind. For locations on the right-hand side of the track, a direct hit occurs when the cyclone passes to within a distance equal to twice the radius of maximum wind. Compare indirect hit, strike.

EMERGENCY OPERATIONS CENTER (EOC): The city facility that serves as a central location for the coordination and control of all emergency preparedness and response.

EL NINO: A warming of Pacific Ocean waters near the Equator that typically occurs every 3 to 7 years. Such an event dictates a shift in "normal" weather patterns.

EMERGENCY BROADCAST SYSTEM: A system designed to permit government officials to issue up-to-date and continuous emergency information and instructions to the public in a threatened or actual emergency.

EMERGENCY PUBLIC INFORMATION: Information disseminated primarily, but not unconditionally, at the time of an emergency frequently includes actions, instructions and direct orders.

EMERGENCY PUBLIC SHELTER: Generally a public school or other such structure designated by city officials as a place of refuge.

EXPLOSIVE DEEPENING: A decrease in the minimum sea-level pressure of a tropical cyclone of 2.5 mb/hr for at least 12 hours or 5 mb/hr for at least six hours.

EVACUATION TIME: The lead time that a populated coastal area must have to safely relocate all residents of vulnerable areas from an approaching hurricane. This time can also be perceived as the necessary amount of time between the local official evacuation order and the arrival of sustained gale force winds and/or flooding.

EXTENT OF EVACUATION: The identification of vulnerable people to evacuate based on estimated damage and/or homes susceptible to hurricane force winds.

EXTRATROPICAL: A term used in advisories and tropical summaries to indicate that a cyclone has lost its tropical characteristics. The term implies both poleward displacement of the cyclone and the conversion of the cyclone's primary energy source from the release of latent heat of condensation to baroclinic (the temperature contrast between warm and cold air masses) processes. It is important to note that cyclones can become extratropical and still retain winds of hurricane or tropical storm force.

EYE: The roughly circular area of comparatively light winds that encompasses the center of a severe tropical cyclone. The eye is either completely or partially surrounded by the eyewall cloud.

EYEWALL / WALL CLOUD: An organized band or ring of cumulonimbus clouds that surround the eye, or light-wind center of a tropical cyclone. Eyewall and wall cloud are used synonymously.

FLOOD WARNING: The expected severity of flooding (minor, moderate or major) as well as where and when the flooding will begin.

FORWARD SPEED: The rate of movement (propagation) of the hurricane eye in mph or knots

FUJIWHARA EFFECT: The tendency of two nearby tropical cyclones to rotate cyclonically about each other.

GALE WARNING: Sustained winds 39-54 miles an hour (34-47 knots) either predicted or occurring. Note: Gale warnings are not normally issued during tropical cyclones.

HURRICANE / TYPHOON: A tropical cyclone in which the maximum sustained surface wind (using the U.S. 1-minute average) is 64 kt (74 mph or 119 km/hr) or more. The term hurricane is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian. The term typhoon is used for Pacific tropical cyclones north of the Equator west of the International Dateline.

HURRICANE ADVISORIES: Notices numbered consecutively for each storm, describing the present and forecasted position and intensity. Advisories are issued at six-hour intervals at midnight, 6 a.m., noon, and 6 p.m., Eastern Daylight Time. Bulletins provide additional information. Each message gives the name, eye position, intensity and forecast movement of the storm.

HURRICANE PATH OR TRACK: Line of movement (propagation) of the eye through an area.

HURRICANE LOCAL STATEMENT: A public release prepared by local National Weather Service offices in or near a threatened area giving specific details for its county/parish warning area on (1) weather conditions, (2) evacuation decisions made by local officials, and (3) other precautions necessary to protect life and property.

HURRICANE/STORM PROBABILITIES: The National Weather Service issues hurricane/tropical storm probabilities in public advisories to realistically assess the threat of a hurricane or tropical storm hitting your community. The probabilities are defined as the chance in percent that the center of the storm will pass within approximately 65 miles of 44 selected locations from Brownsville, Texas, to Eastport, Maine.

HURRICANE SEASON: The portion of the year having a relatively high incidence of hurricanes. The hurricane season in the Atlantic, Caribbean, and Gulf of Mexico runs from June 1 to November 30. The hurricane season in the Eastern Pacific basin runs from May 15 to November 30. The hurricane season in the Central Pacific basin runs from June 1 to November 30.

HURRICANE WARNING: An announcement that hurricane conditions (sustained winds of 74 mph or higher) are *expected* somewhere within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds.

HURRICANE WATCH: An announcement that hurricane conditions (sustained winds of 74 mph or higher) are *possible* within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds.

INDIRECT HIT: Generally refers to locations that do not experience a direct hit from a tropical cyclone, but do experience hurricane force winds (either sustained or gusts) or tides of at least 4 feet above normal.

INVEST: A weather system for which a tropical cyclone forecast center (NHC, CPHC, or JTWC) is interested in collecting specialized data sets (e.g., microwave imagery) and/or running model guidance. Once a system has been designated as an invest, data collection and processing is initiated on a number of government and academic web sites, including the Naval Research Laboratory (NRL) and the University of Wisconsin Cooperative Institute for Meteorological Satellite Studies (UW-CIMSS). The designation of a system as an invest does not correspond to any particular likelihood of development of the system into a tropical cyclone; operational products such as the Tropical Weather Outlook or the JTWC/TCFA should be consulted for this purpose.

LANDFALL: The intersection of the surface center of a tropical cyclone with a coastline. Because the strongest winds in a tropical cyclone are not located precisely at the center, it is possible for a cyclone's strongest winds to be experienced over land even if landfall does not occur. Similarly, it is possible for a tropical cyclone to make landfall and have its strongest winds remain over the water. Compare direct hit, indirect hit, and strike.

MAJOR HURRICANE: A hurricane that is classified as Category 3 or higher.

NATIONAL GEODETIC VERTICAL DATUM OF 1929 [NGVD 1929]: A fixed reference adopted as a standard geodetic datum for elevations determined by leveling. The datum was derived for surveys from a general adjustment of the first-order leveling nets of both the United States and Canada. In the adjustment, mean sea level was held fixed as observed at 21 tide stations in the United States and 5 in Canada. The year indicates the time of the general adjustment. A synonym for Sea-level Datum of 1929. The geodetic datum is fixed and does not take into account the changing stands of sea level. Because there are many variables affecting sea level, and because the geodetic datum represents a best fit over a broad area, the relationship between the geodetic datum and local mean sea level is not consistent from one location to another in either time or space. For this reason, the National Geodetic Vertical Datum should not be confused with mean sea level.

NOAA WEATHER RADIO: A 24-hour continuous broadcast of existing and forecasted weather conditions.

POST-STORM REPORT: A report issued by a local National Weather Service office summarizing the impact of a tropical cyclone on its forecast area. These reports include information on observed winds, pressures, storm surges, rainfall, tornadoes, damage and casualties.

POST-TROPICAL CYCLONE: A former tropical cyclone. This generic term describes a cyclone that no longer possesses sufficient tropical characteristics to be considered a tropical cyclone. Post-tropical cyclones can continue carrying heavy rains and high winds. Note that former tropical cyclones that have become fully extratropical...as well as remnant lows...are two classes of post-tropical cyclones.

PRE-EYE LANDFALL TIME: The time before actual hurricane eye landfall within which evacuation cannot be carried out because of earlier effects, such as the inundation of evacuation routes from the storm surge or rainfall and the arrival of sustained gale force winds. It is composed of the time of arrival of sustained gale-force winds or the time roadway inundation from storm surge/rainfall begins, whichever comes first.

PRELIMINARY REPORT: Now known as the "Tropical Cyclone Report". A report summarizing the life history and effects of an Atlantic or eastern Pacific tropical cyclone. It contains a summary of the cyclone life cycle and pertinent meteorological data, including the post-analysis best track (six-hourly positions and intensities) and other meteorological statistics. It also contains a description of damage and casualties the system produced, as well as information on forecasts and warnings associated with the cyclone. NHC writes a report on every tropical cyclone in its area of responsibility.

PRESENT MOVEMENT: The best estimate of the movement of the center of a tropical cyclone at a given time and given position. This estimate does not reflect the short-period, small scale oscillations of the cyclone center.

PUBLIC INFORMATION OFFICER: A person appointed by a City Emergency Operations Center to be responsible for the formulating and coordinating of the dissemination of emergency public information with both the electronic and written media, ensuring that accurate information is being released to the general public.

RADIUS OF MAXIMUM WINDS: The distance from the center of a tropical cyclone to the location of the cyclone's maximum winds. In well-developed hurricanes, the radius of maximum winds is generally found at the inner edge of the eyewall.

RAPID DEEPENING: A decrease in the minimum sea-level pressure of a tropical cyclone of 1.75 mb/hr or 42 mb for 24 hours.

RELOCATED: A term used in an advisory to indicate that a vector drawn from the preceding advisory position to the latest known position is not necessarily a reasonable representation of the cyclone's movement.

REMNANT LOW: A post-tropical cyclone that no longer possesses the convective organization required of a tropical cyclone...and has maximum sustained winds of less than 34 knots. The term is most commonly applied to the nearly deep-convection-free swirls of stratocumulus in the eastern North Pacific.

SAFFIR-SIMPSON HURRICANE WIND SCALE: The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 categorization based on the hurricane's intensity at the indicated time. The scale provides examples of the type of damage and impacts in the United States associated with winds of the indicated intensity.

SEVERE THUNDERSTORM WARNING: Indicates that severe thunderstorms have been sighted or indicated on radar.

SEVERE THUNDERSTORM WATCH: Indicates that conditions are favorable for lightning, damaging winds greater than 58 miles an hour and hail and/or heavy rainfall.

SHELTER PERIOD: The period in which people are forced to evacuate their homes. This time may vary from several hours to a couple of days depending upon the severity of the hurricane.

SLOSH (Sea, Lake and Overland Surges from Hurricanes): A computerized model that is able to estimate the overland tidal surge heights and winds that result from hypothetical hurricanes with selected characteristics in pressure, size, forward speed, track and winds. The resultant tidal surge is then applied to a specific locale's shoreline, incorporating the unique bay and river configurations, water depths, bridges, roads and other physical features. The model estimates open coastline heights as well as surge heights over land, thus predicting the degree of propagation or run-up of the surge into inland areas.

SMALL CRAFT ADVISORY: A warning of winds from 20 to 33 knots or for sea conditions either forecasted or occurring that are considered potentially hazardous to small boats in coastal waters.

SPECIAL MARINE WARNING: A warning for hazardous weather conditions, usually short and not adequately covered by existing marine warnings. Such conditions include sustained winds or gusts of 35 knots or more for 2 hours or less.

SQUALL: A sudden increase of wind speed by at least 18 mph and rising to 25 mph or more and lasting for at least one minute.

STORM SURGE: An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the cyclone. Storm surge is usually estimated by subtracting the normal or astronomic high tide from the observed storm tide.

STORM TIDE: The actual level of sea water resulting from the astronomic tide combined with the storm surge.

STORM WARNING: A warning of 1-minute sustained surface winds of 48 kt (55 mph or 88 km/hr) or greater, either predicted or occurring, not directly associated with tropical cyclones.

STRIKE: http://www.nhc.noaa.gov/gifs/strikezone.gifFor any particular location, a hurricane strike occurs if that location passes within the hurricane's strike circle, a circle of 125 n mi diameter, centered 12.5 n mi to the right of the hurricane center (looking in the direction of motion). This circle is meant to depict the typical extent of hurricane force winds, which are approximately 75 n mi to the right of the center and 50 n mi to the left.

SUBTROPICAL CYCLONE: A non-frontal low pressure system that has characteristics of both tropical and extratropical cyclones. This system is typically an upper-level cold low with circulation extending to the surface layer and maximum sustained winds generally occurring at a radius of about 100 miles or more from the center. In comparison to tropical cyclones, such systems have a relatively broad zone of maximum winds that is located farther from the center, and typically have a less symmetric wind field and distribution of convection.

SUBTROPICAL DEPRESSION: A subtropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) is 33 kt (38 mph or 62 km/hr) or less.

SUBTROPICAL STORM: A subtropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) is 34 kt (39 mph or 63 km/hr) or more.

SYNOPTIC TRACK: Weather reconnaissance mission flown to provide vital meteorological information in data sparse ocean areas as a supplement to existing surface, radar, and satellite data. Synoptic flights better define the upper atmosphere and aid in the prediction of tropical cyclone development and movement.

TROPICAL CYCLONE: A warm-core non-frontal synoptic-scale cyclone, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center. Once formed, a tropical cyclone is maintained by the extraction of heat energy from the ocean at high temperature and heat export at the low temperatures of the upper troposphere. In this they differ from extratropical cyclones, which derive their energy from horizontal temperature contrasts in the atmosphere (baroclinic effects).

TROPICAL CYCLONE PLAN OF THE DAY: A coordinated mission plan that tasks operational weather reconnaissance requirements during the next 1100 to 1100 UTC day or as required, describes reconnaissance flights committed to satisfy both operational and research requirements, and identifies possible reconnaissance requirements for the succeeding 24-hour period.

TROPICAL DEPRESSION: A tropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) is 33 kt (38 mph or 62 km/hr) or less.

TROPICAL DISTURBANCE: A discrete tropical weather system of apparently organized convection -- generally 100 to 300 nmi in diameter -- originating in the tropics or subtropics, having a nonfrontal migratory character, and maintaining its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field.

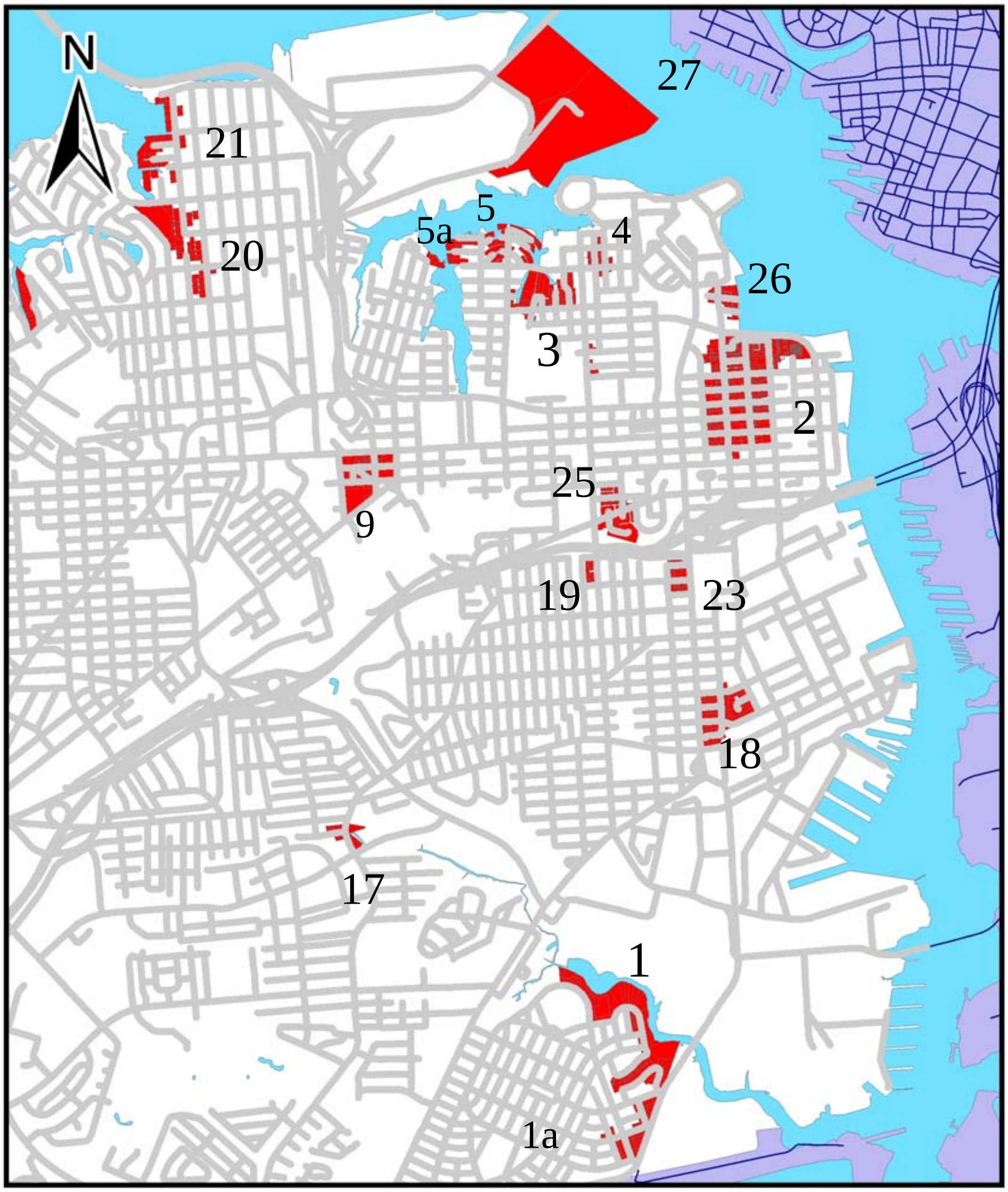
TROPICAL STORM: A tropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) ranges from 34 kt (39 mph or 63 km/hr) to 63 kt (73 mph or 118 km/hr).

TROPICAL STORM WARNING: An announcement that tropical storm conditions (sustained winds of 39 to 73 mph) are *expected* somewhere within the specified coastal area within 36 hours.

TROPICAL STORM WATCH: An announcement that tropical storm conditions (sustained winds of 39 to 73 mph) are *possible* within the specified coastal area within 48 hours.

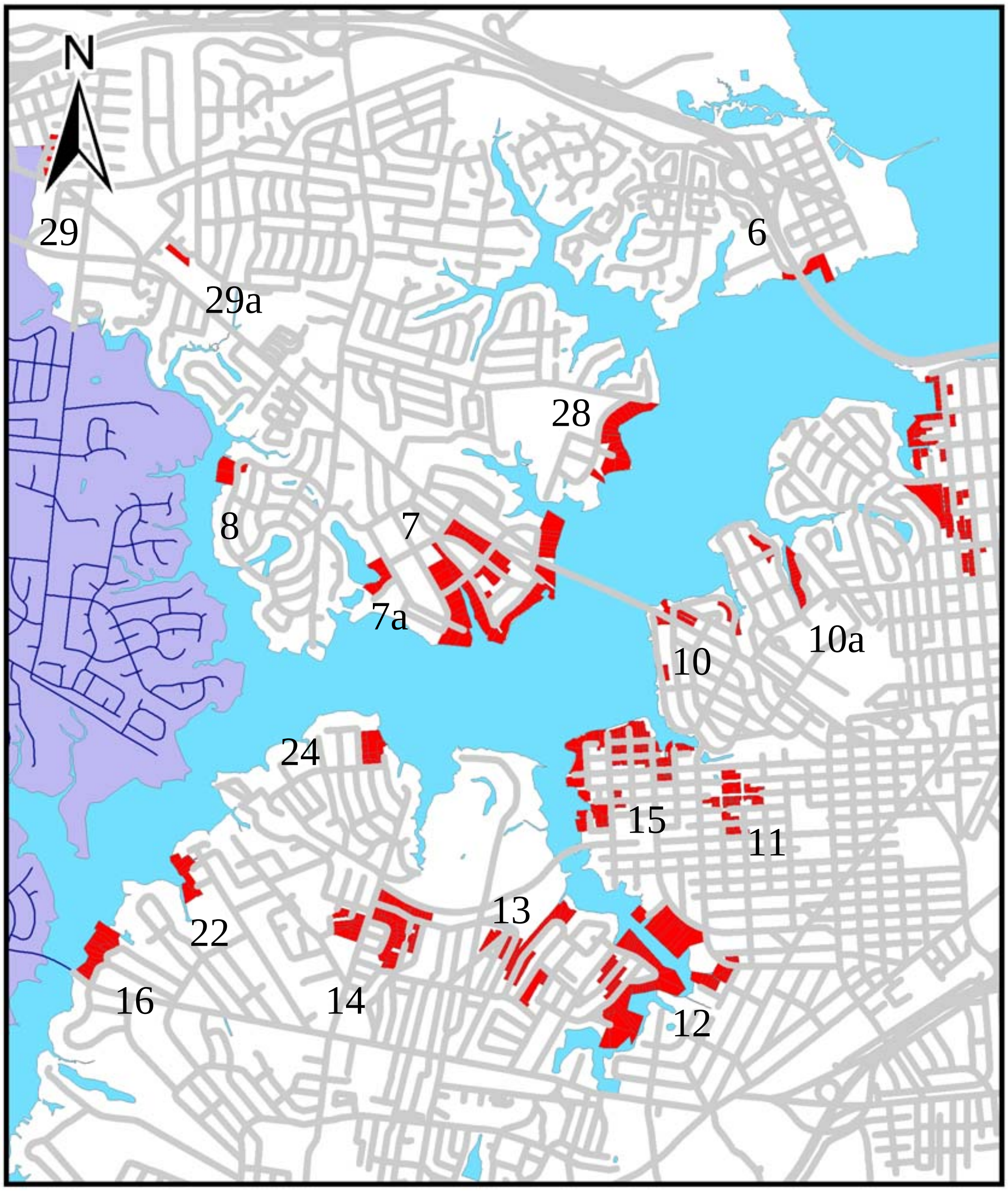
TROPICAL WAVE: A trough or cyclonic curvature maximum in the trade-wind easterlies. The wave may reach maximum amplitude in the lower middle troposphere.

G. Repetitive Loss Areas



REPETITIVE LOSS AREAS

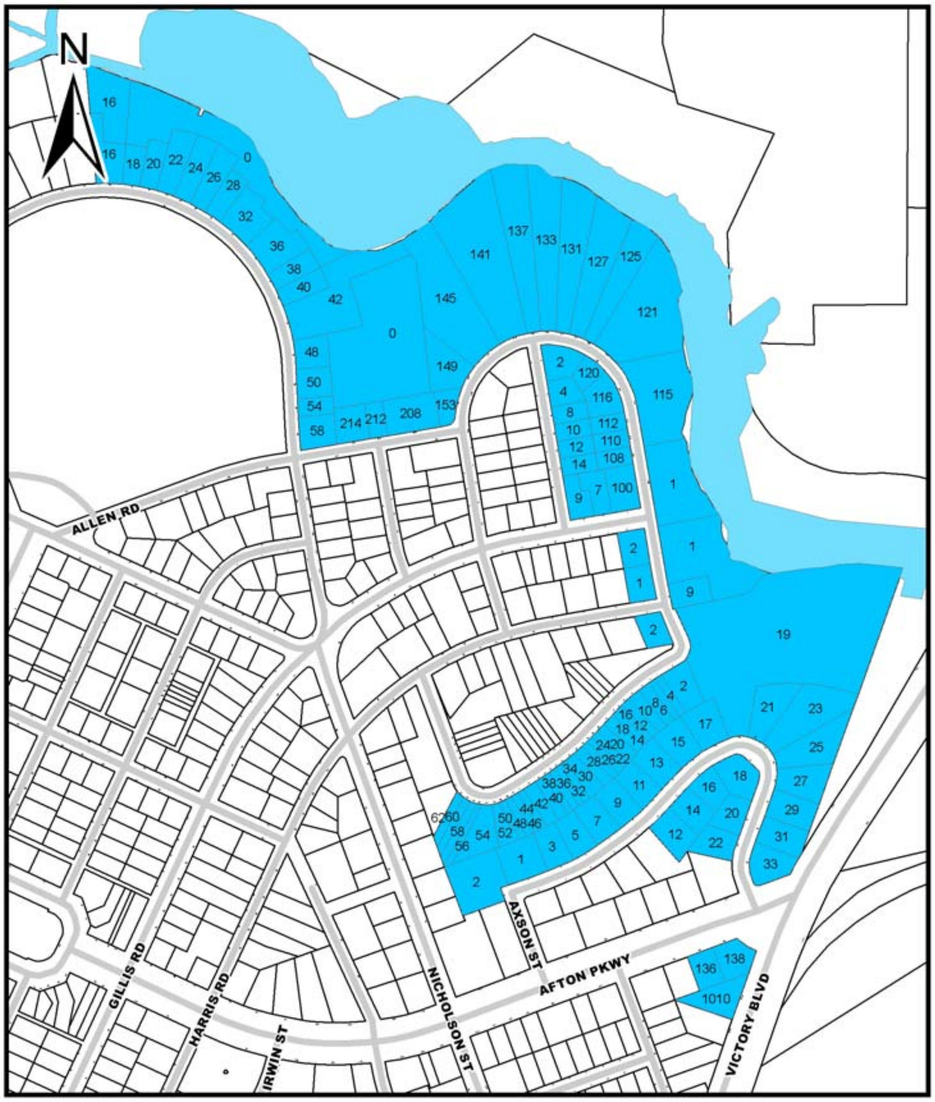
REPETITIVE LOSS PARCEL



REPETITIVE LOSS AREAS

REPETITIVE LOSS PARCEL

H. Individual Repetitive Loss Area Map



REPETITIVE LOSS MAP 1

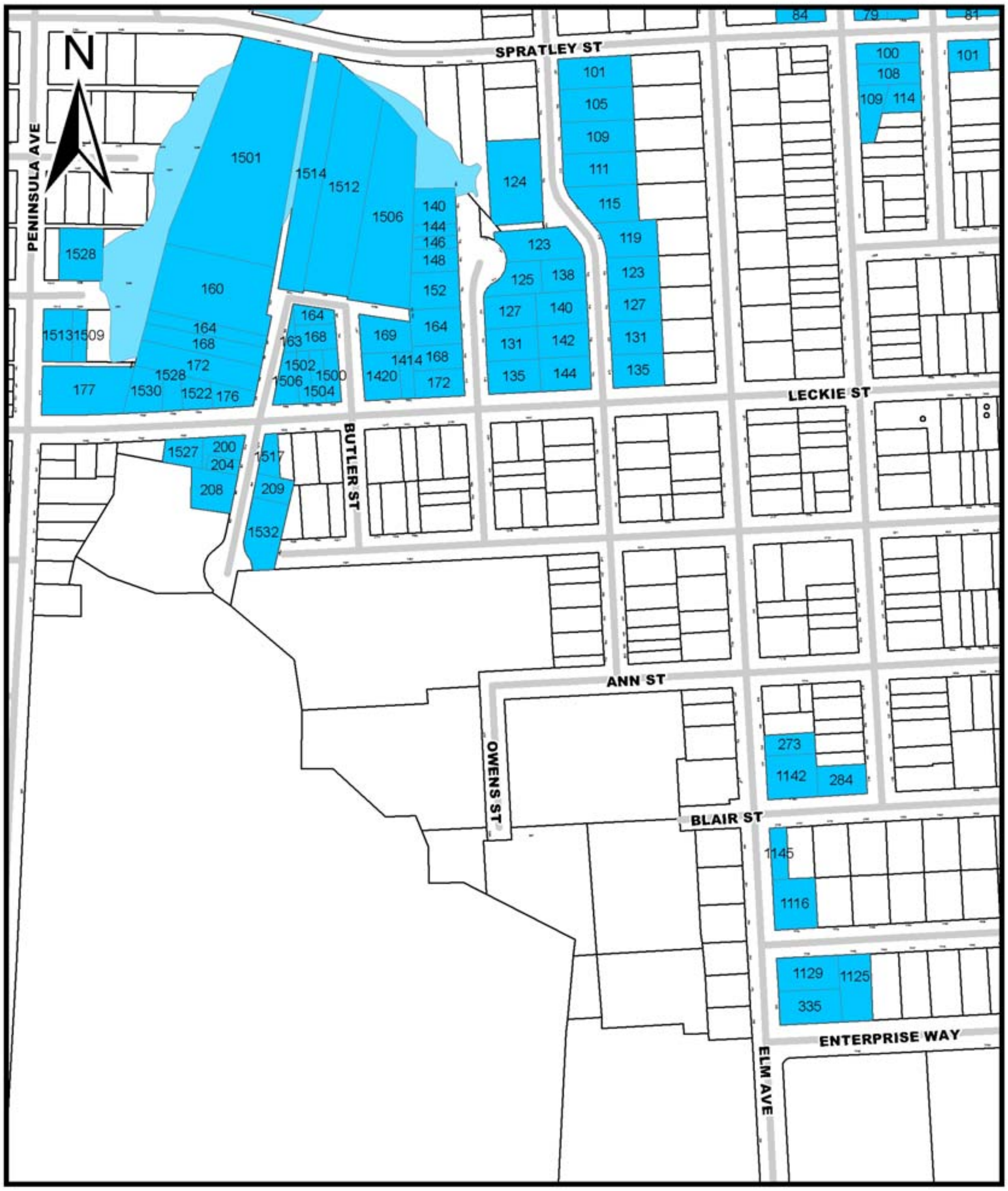
REPETITIVE LOSS PARCEL

REPETITIVE LOSS MAP 1a

REPETITIVE LOSS PARCEL

REPETITIVE LOSS MAP 2

REPETITIVE LOSS PARCEL

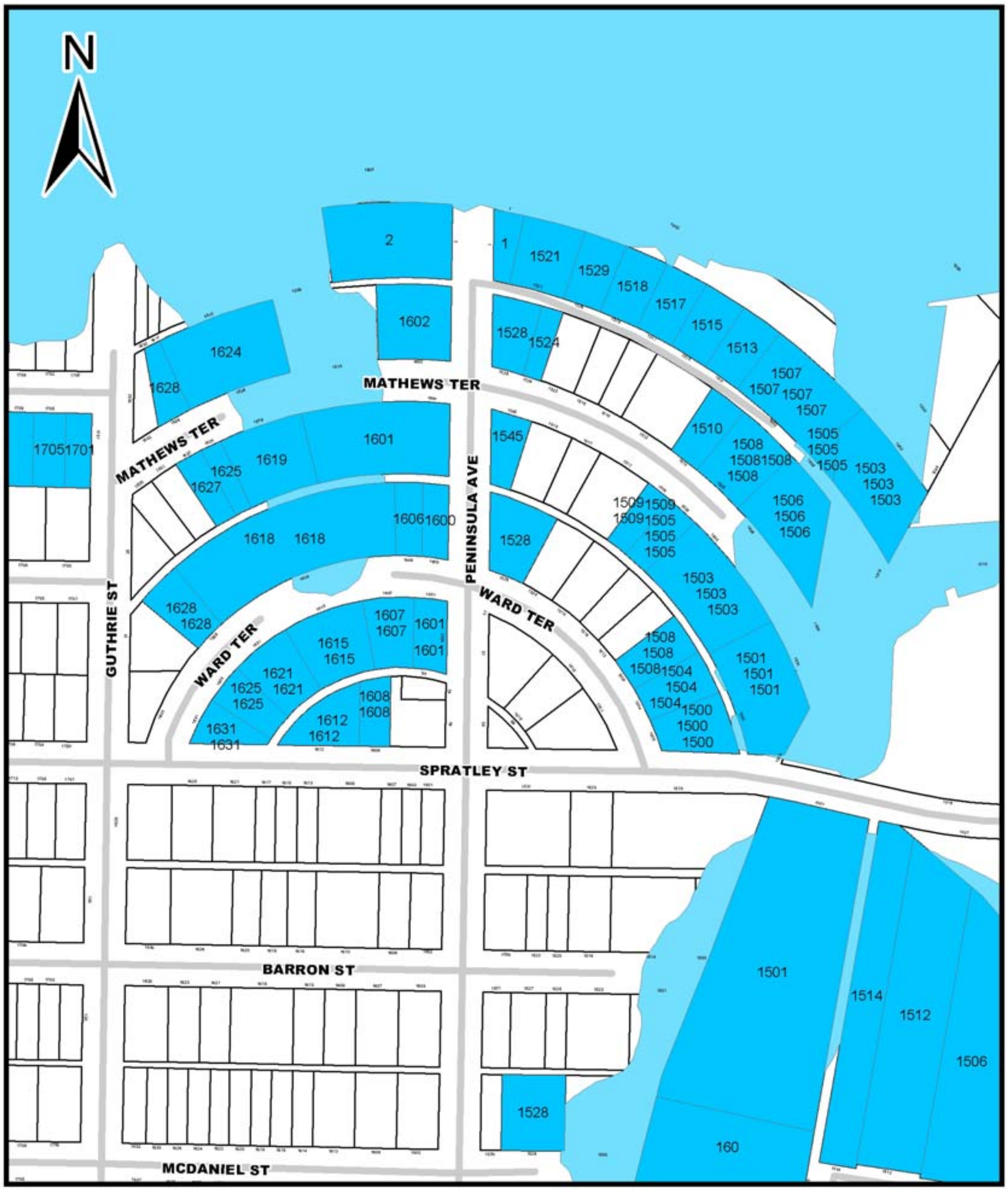


REPETITIVE LOSS MAP 3

REPETITIVE LOSS PARCEL

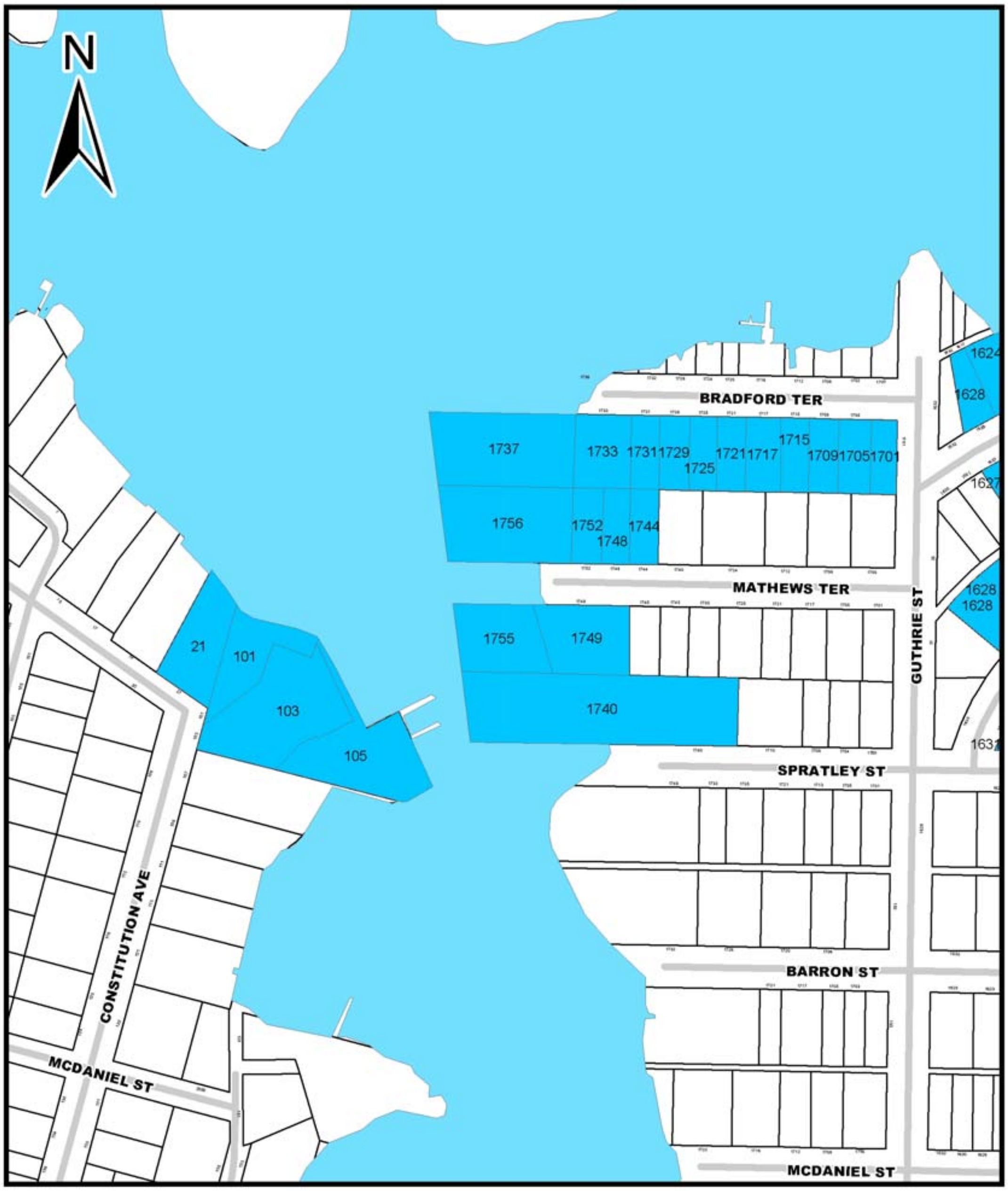
REPETITIVE LOSS MAP 4

REPETITIVE LOSS PARCEL



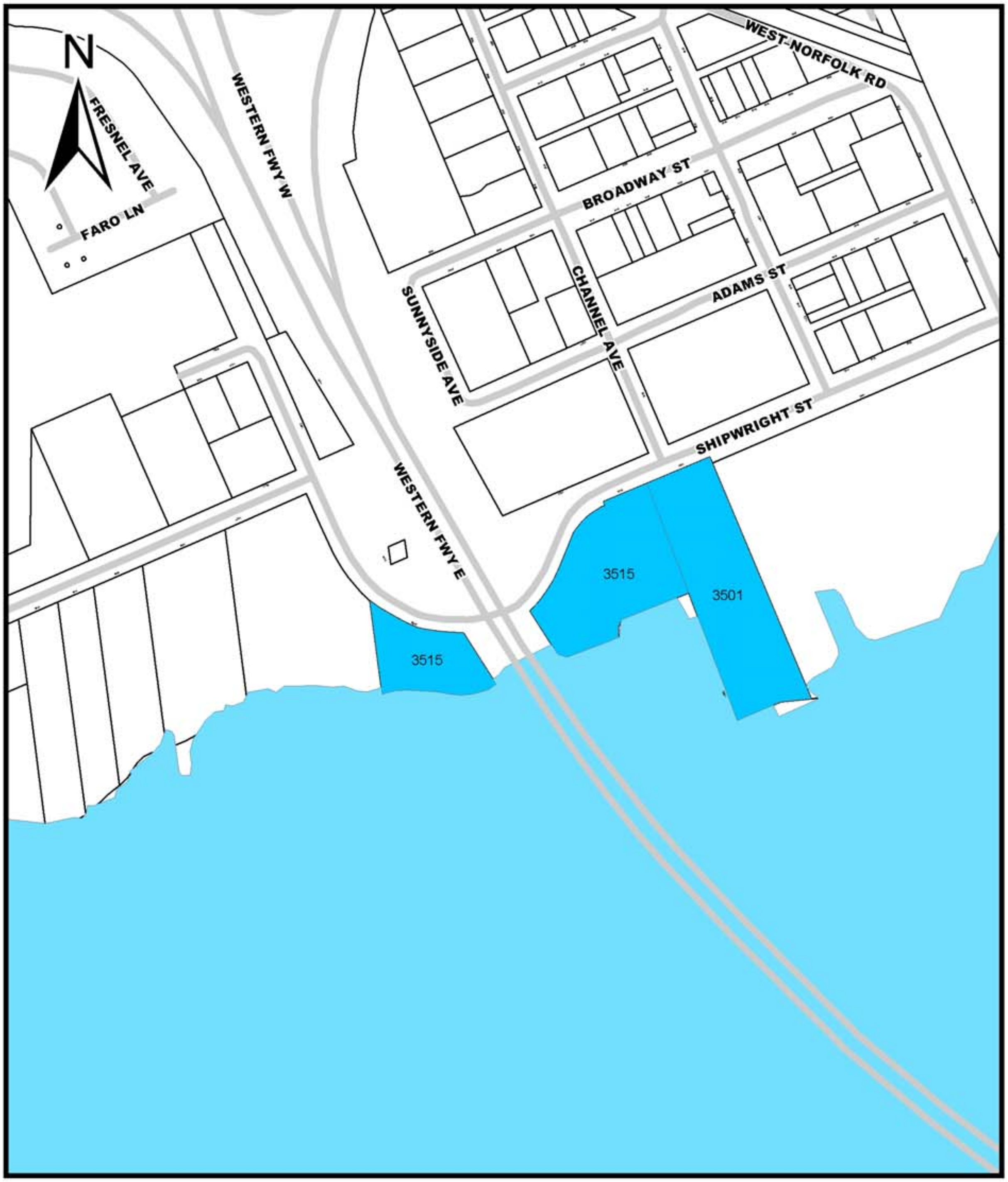
REPETITIVE LOSS MAP 5

REPETITIVE LOSS PARCEL



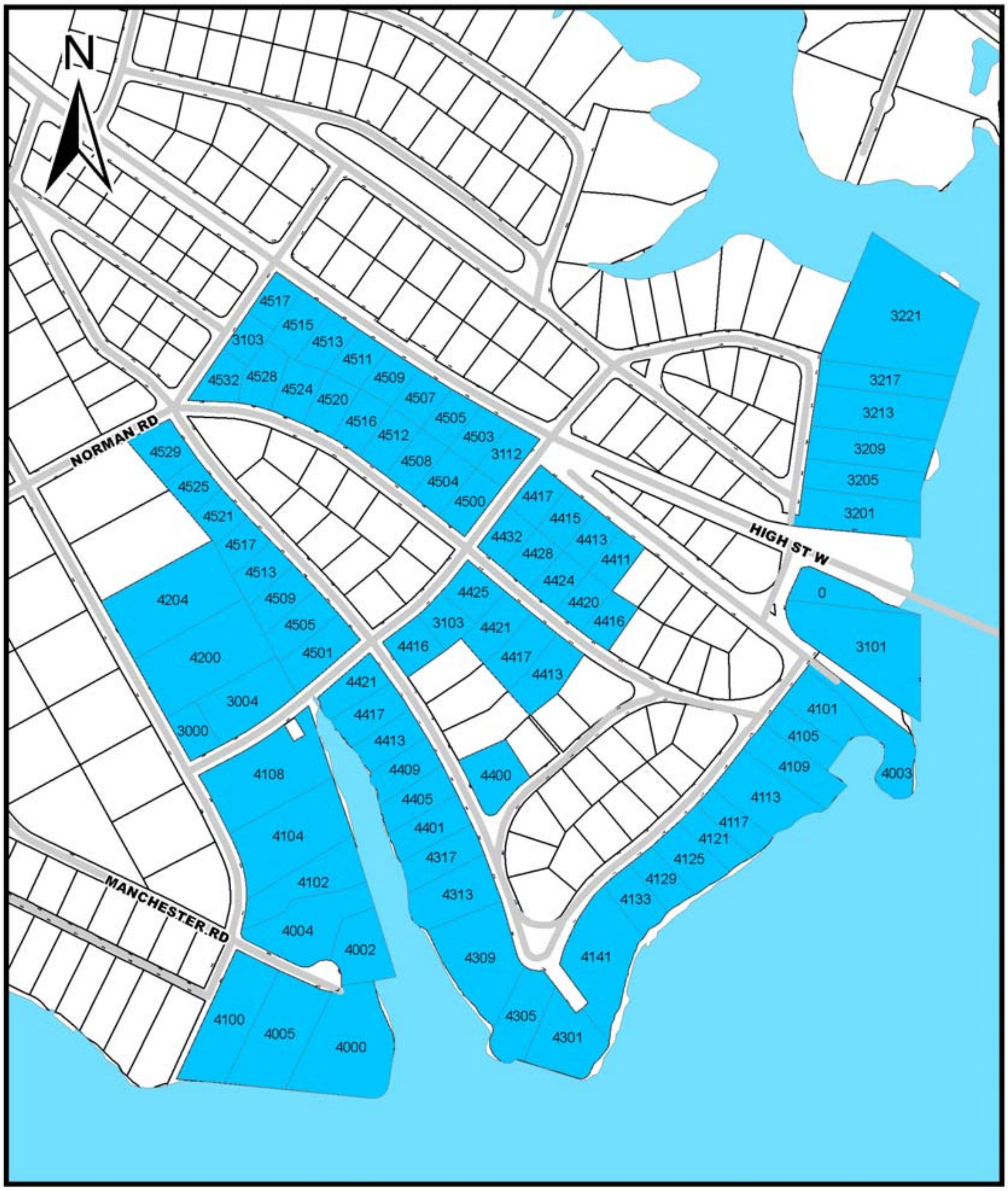
REPETITIVE LOSS MAP <u>5a</u>

REPETITIVE LOSS PARCEL



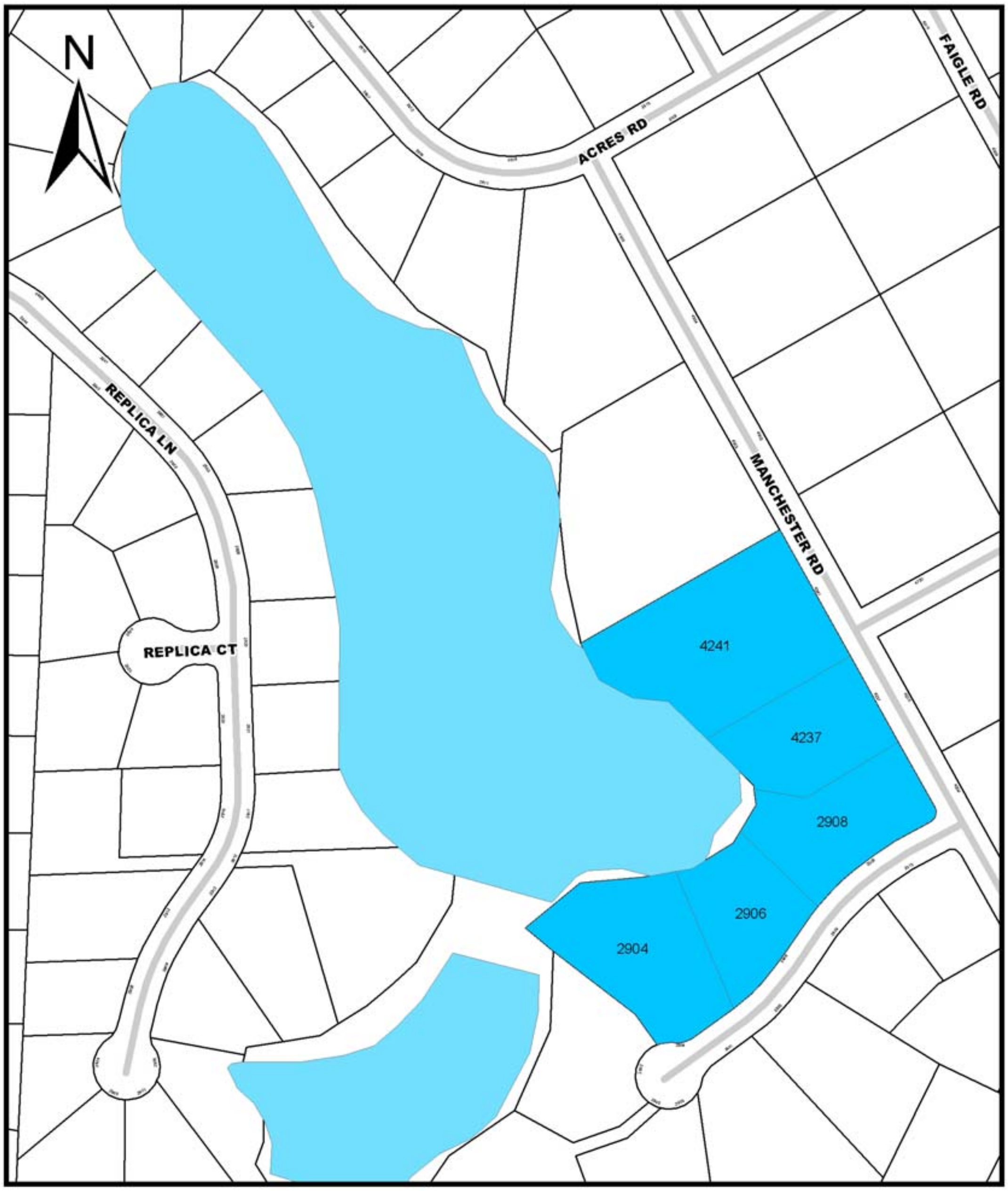
REPETITIVE LOSS MAP 6

REPETITIVE LOSS PARCEL



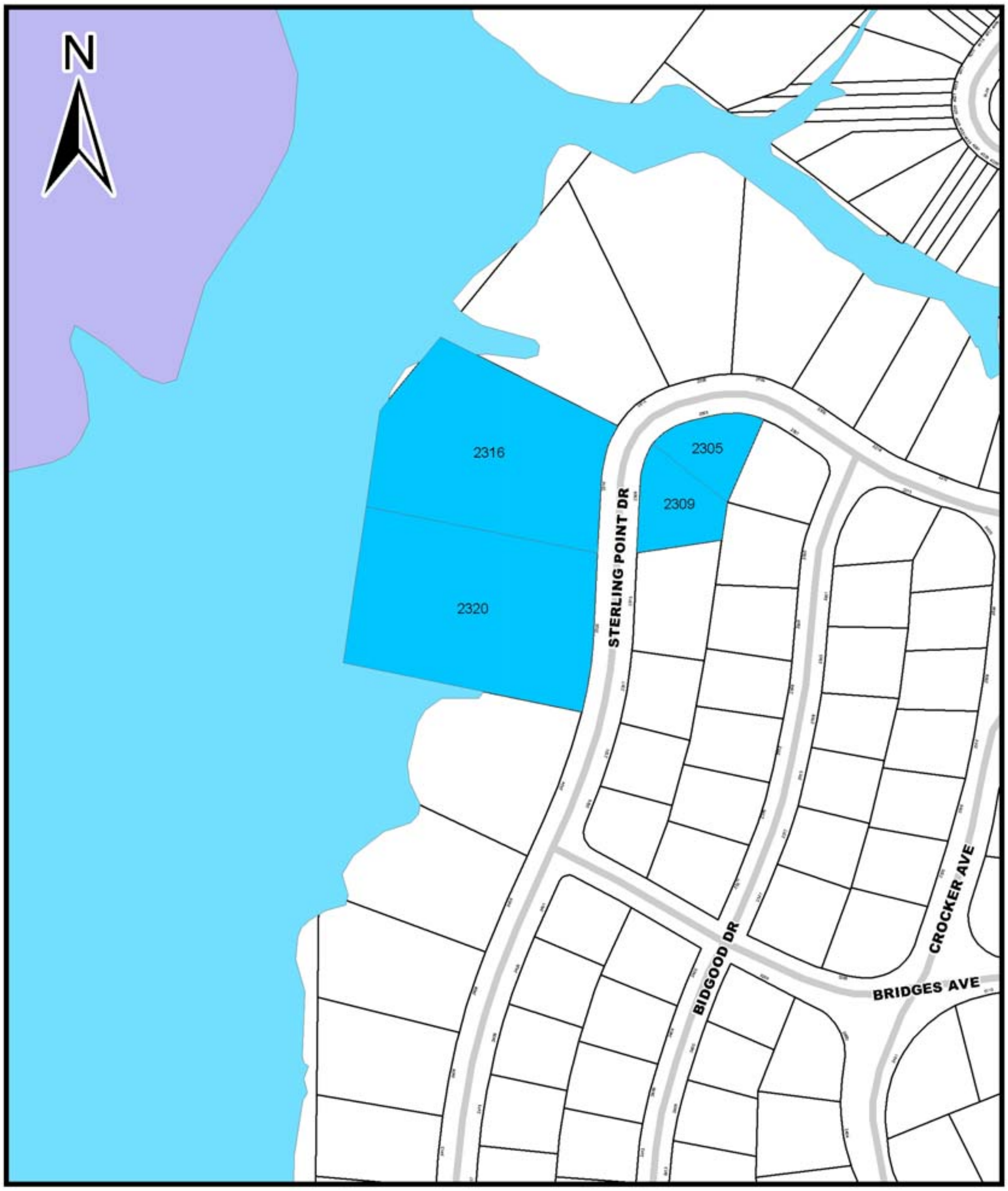
REPETITIVE LOSS MAP 7

REPETITIVE LOSS PARCEL



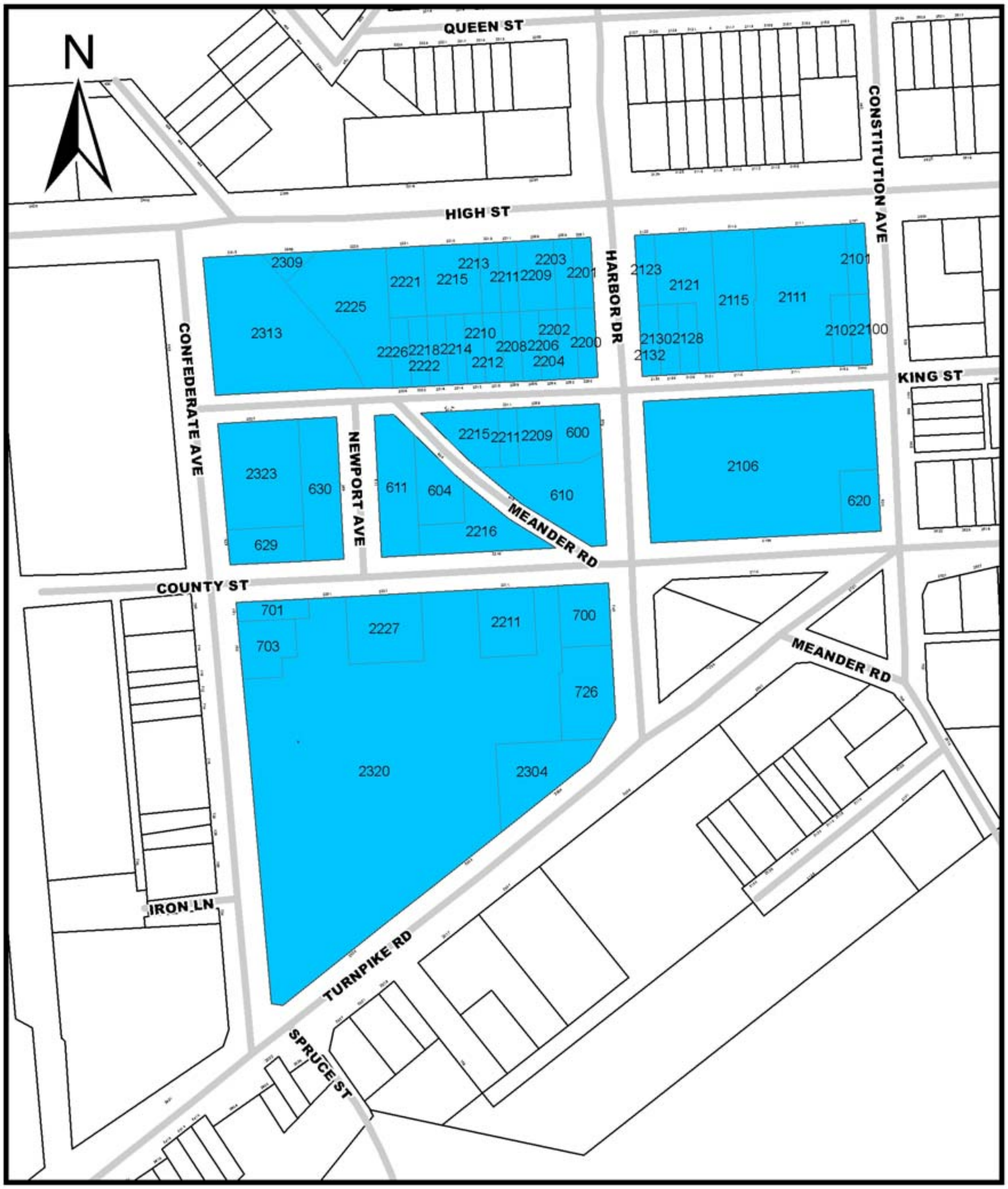
REPETITIVE LOSS MAP 7a

REPETITIVE LOSS PARCEL



REPETITIVE LOSS MAP 8

REPETITIVE LOSS PARCEL

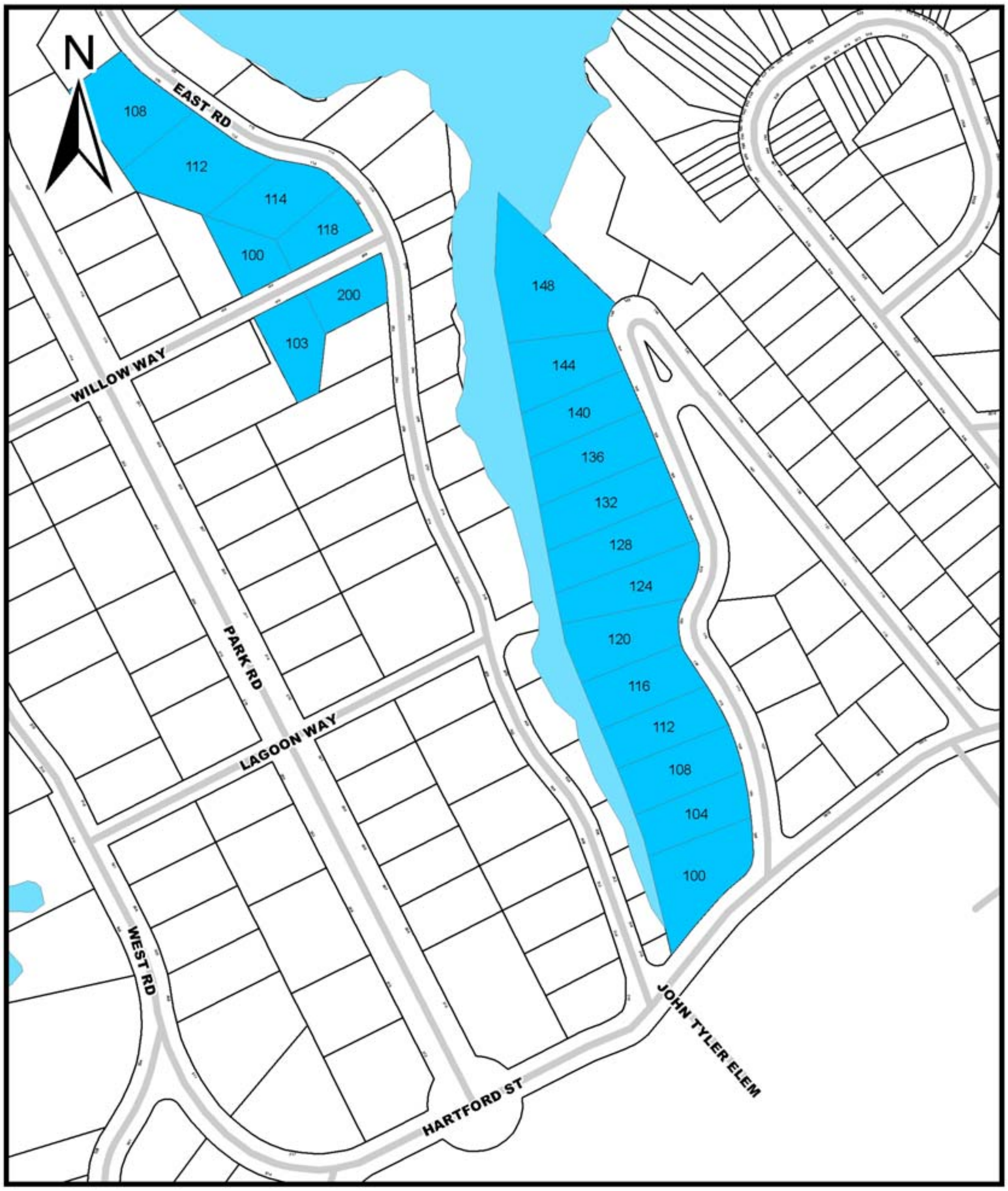


REPETITIVE LOSS MAP 9

REPETITIVE LOSS PARCEL

REPETITIVE LOSS MAP 10

REPETITIVE LOSS PARCEL

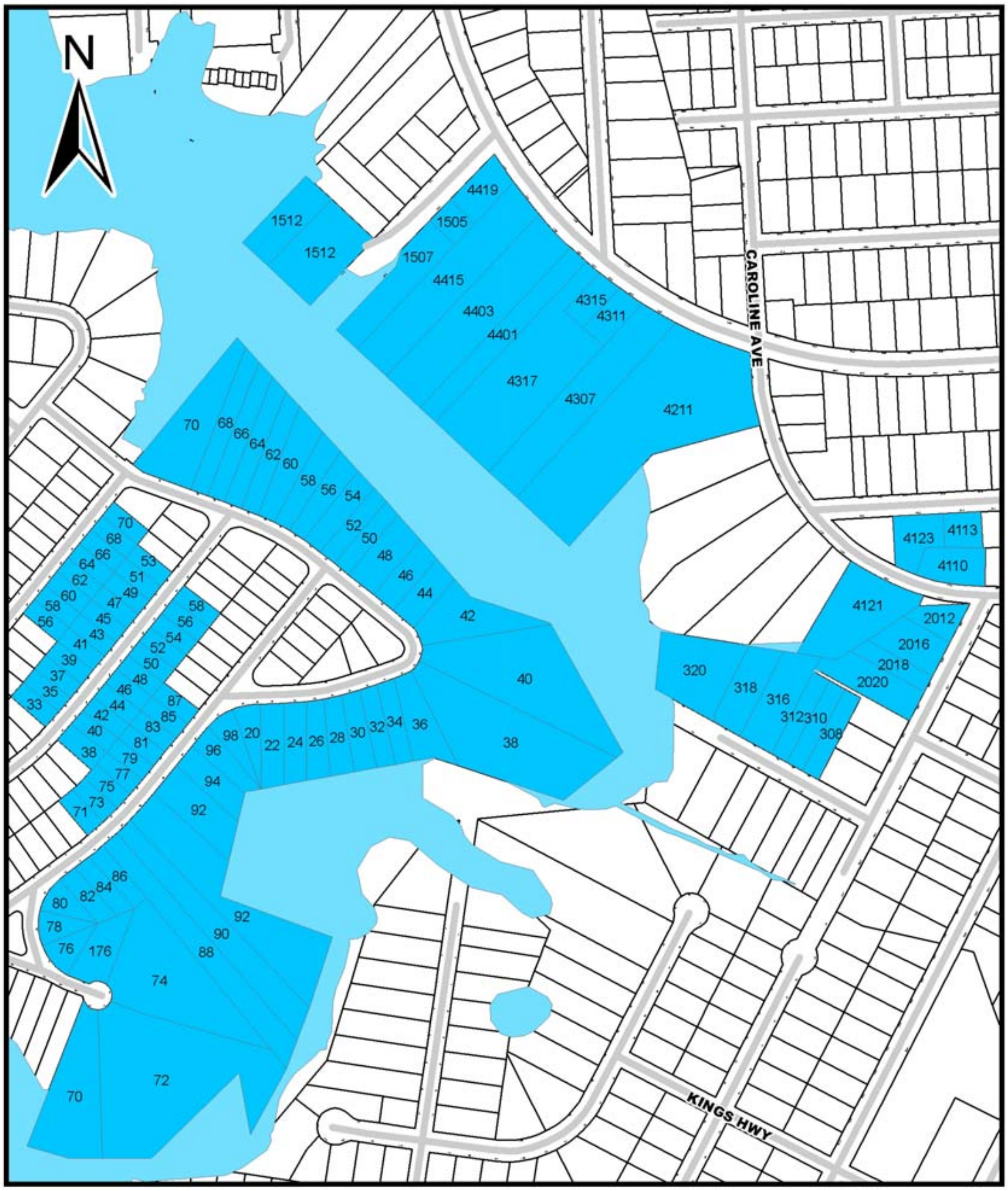


REPETITIVE LOSS MAP 10a

REPETITIVE LOSS PARCEL

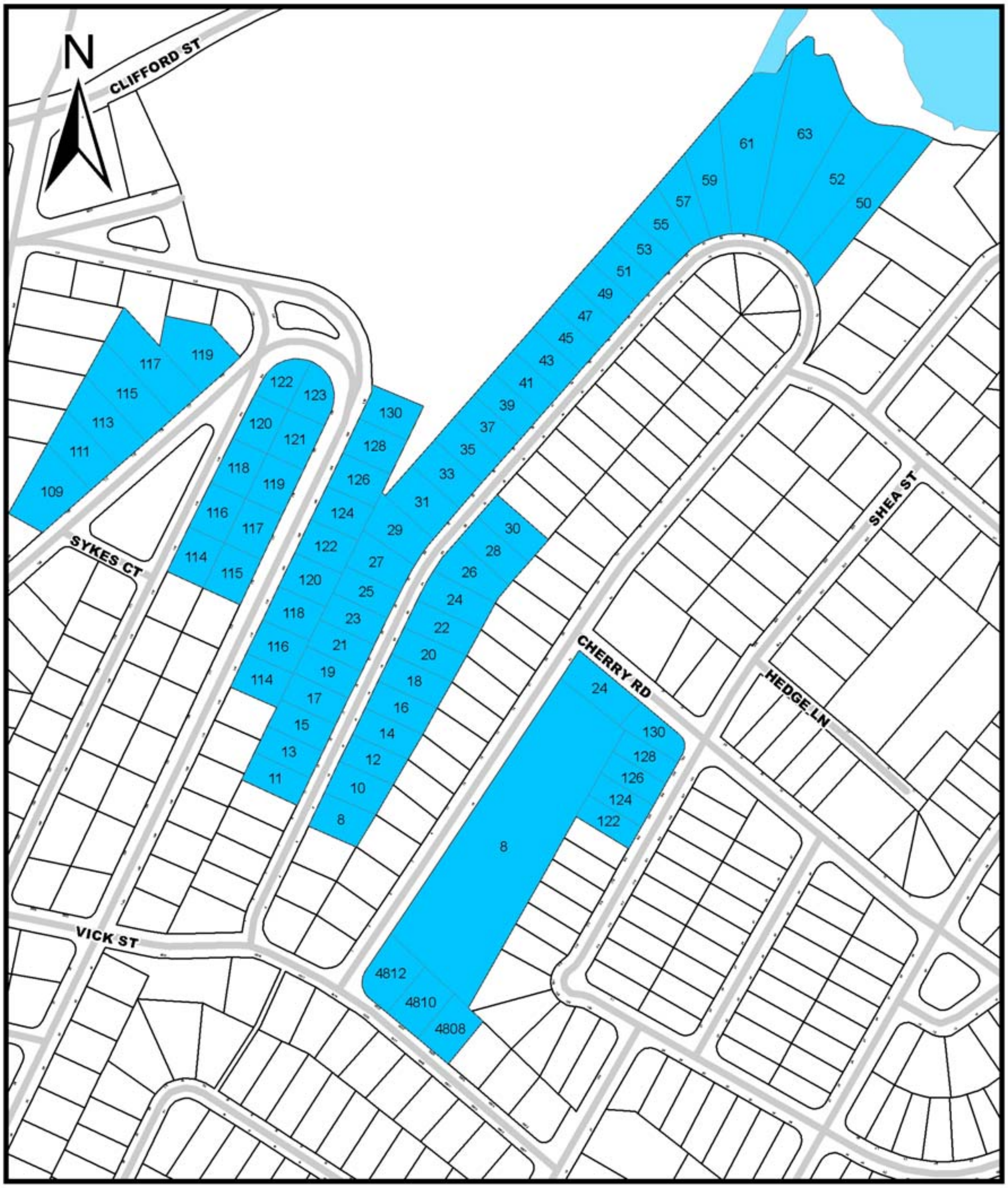
REPETITIVE LOSS MAP 11

REPETITIVE LOSS PARCEL



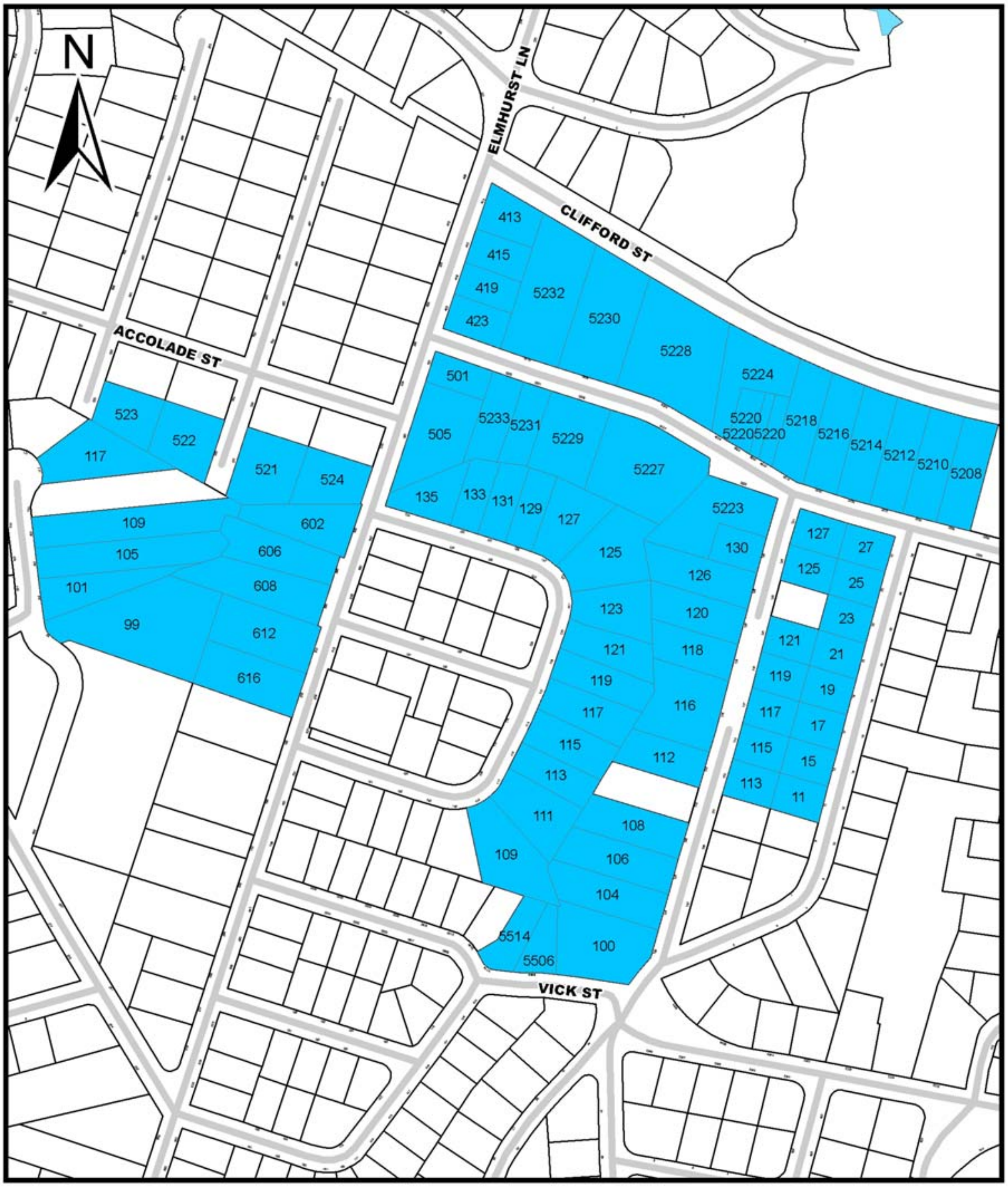
REPETITIVE LOSS MAP 12

REPETITIVE LOSS PARCEL



REPETITIVE LOSS MAP 13

REPETITIVE LOSS PARCEL

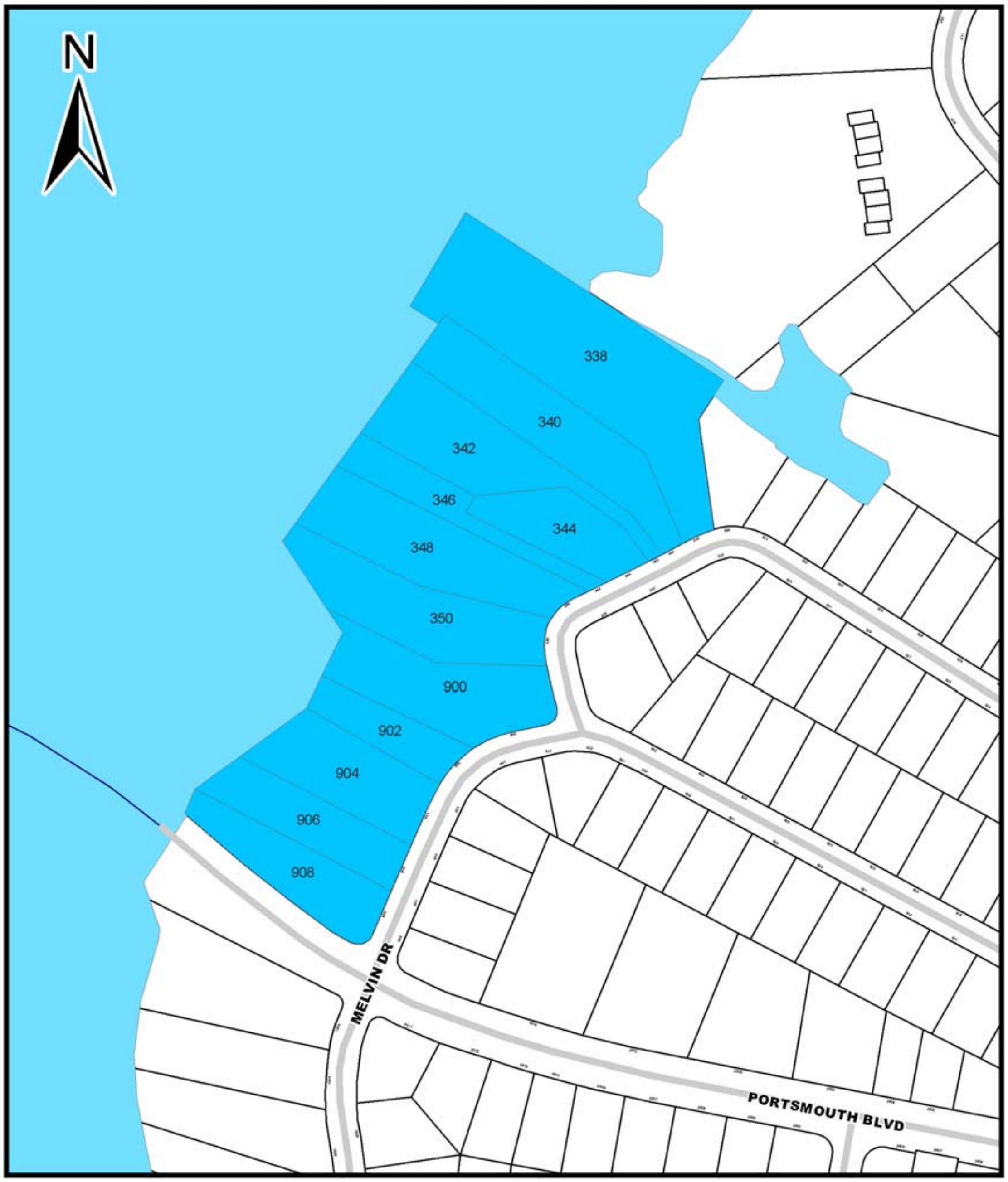


REPETITIVE LOSS MAP 14

REPETITIVE LOSS PARCEL

REPETITIVE LOSS MAP 15

REPETITIVE LOSS PARCEL

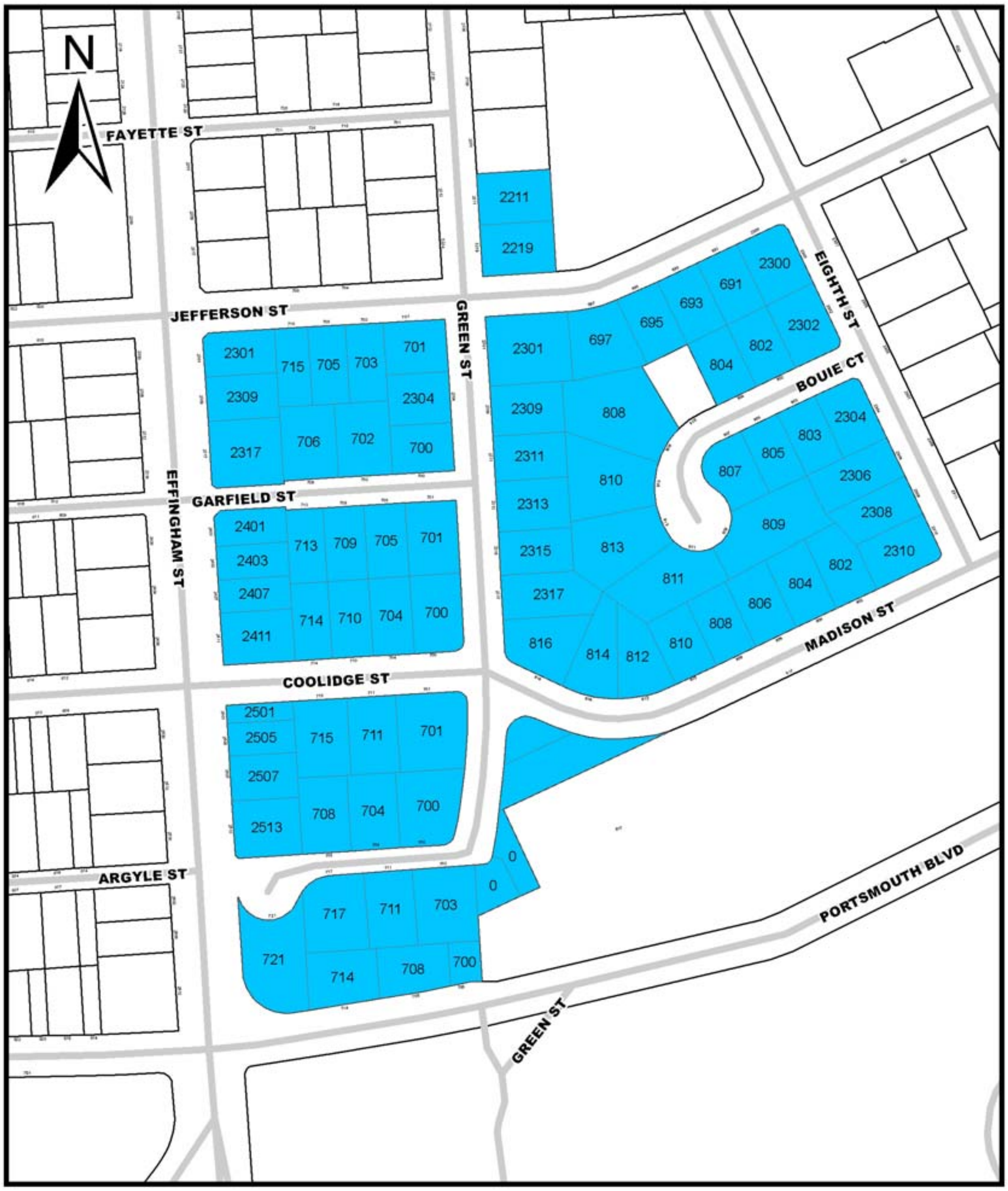


REPETITIVE LOSS MAP 16

REPETITIVE LOSS PARCEL

REPETITIVE LOSS MAP 17

REPETITIVE LOSS PARCEL



REPETITIVE LOSS MAP 18

REPETITIVE LOSS PARCEL

REPETITIVE LOSS MAP 19

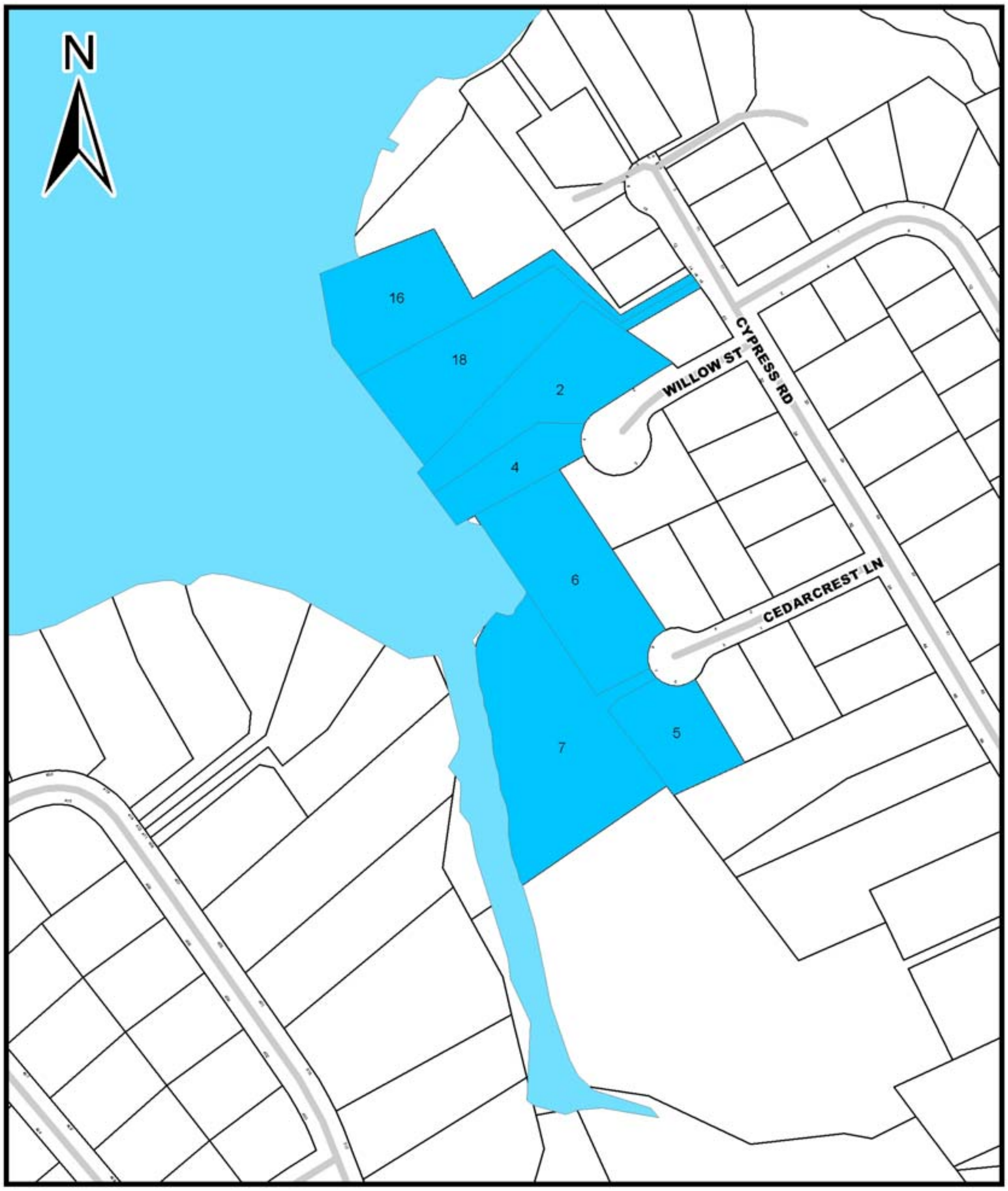
REPETITIVE LOSS PARCEL

REPETITIVE LOSS MAP 20

REPETITIVE LOSS PARCEL

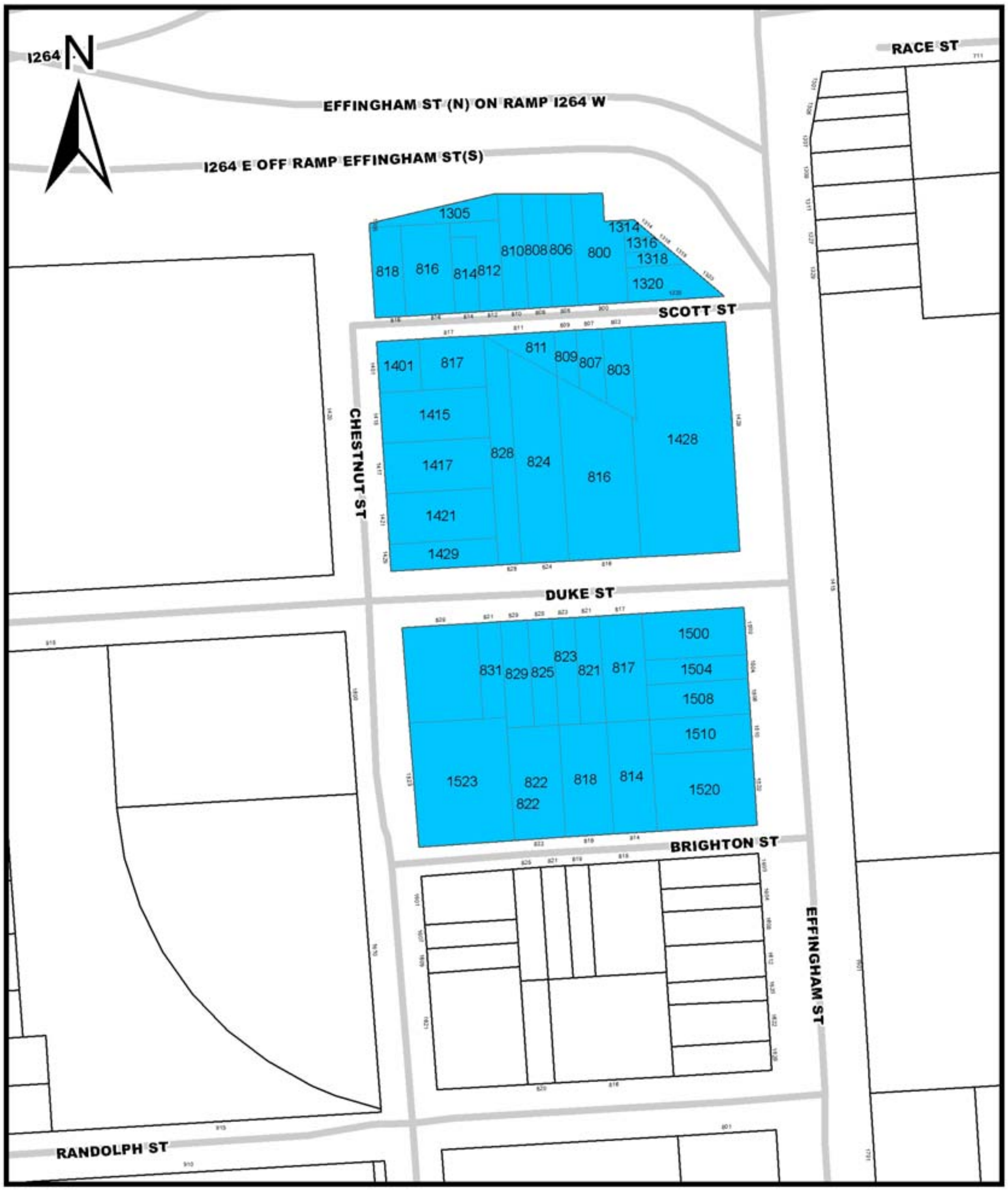
REPETITIVE LOSS MAP 21

REPETITIVE LOSS PARCEL



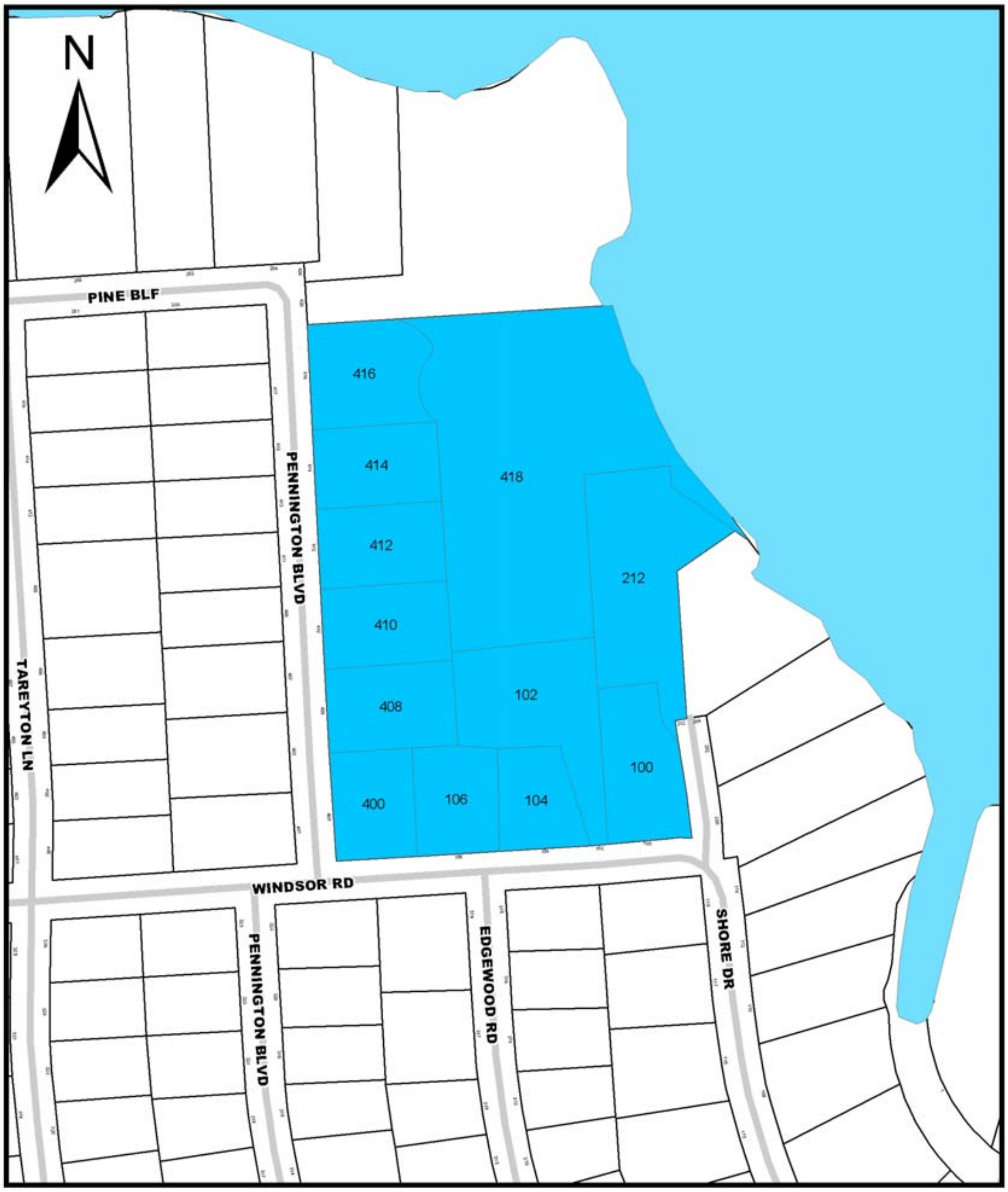
REPETITIVE LOSS MAP 22

REPETITIVE LOSS PARCEL



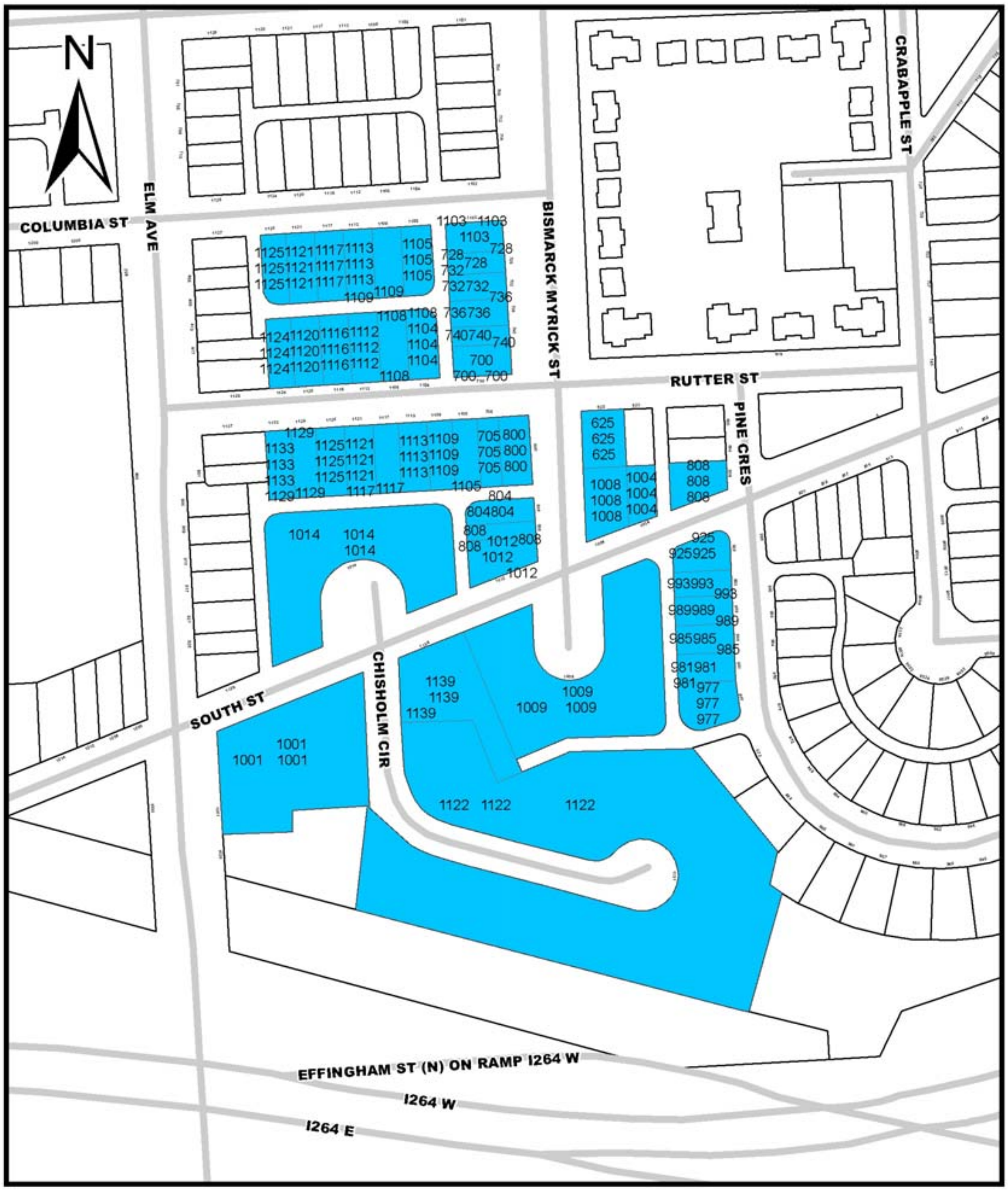
REPETITIVE LOSS MAP 23

REPETITIVE LOSS PARCEL



REPETITIVE LOSS MAP 24

REPETITIVE LOSS PARCEL

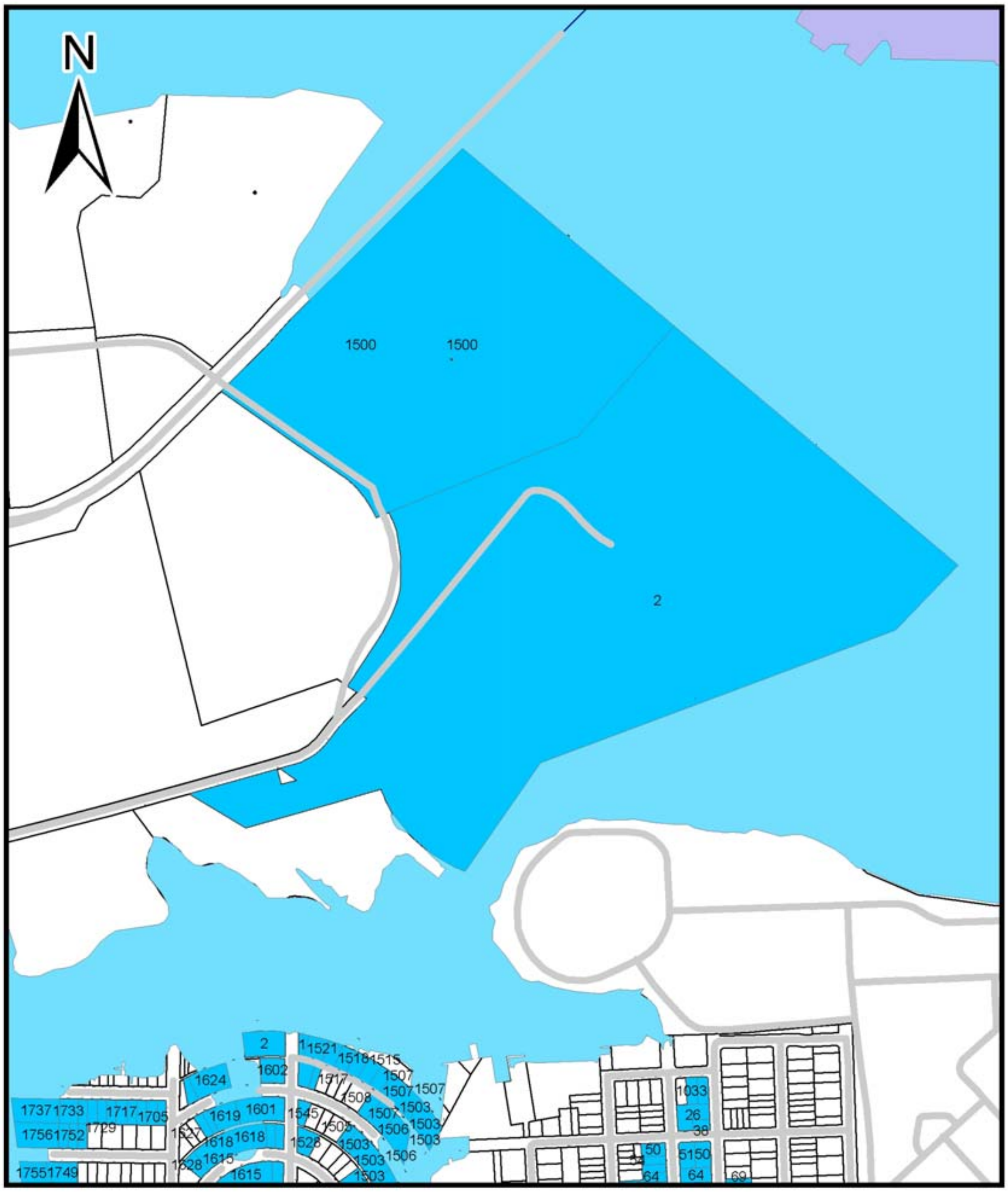


REPETITIVE LOSS MAP 25

REPETITIVE LOSS PARCEL

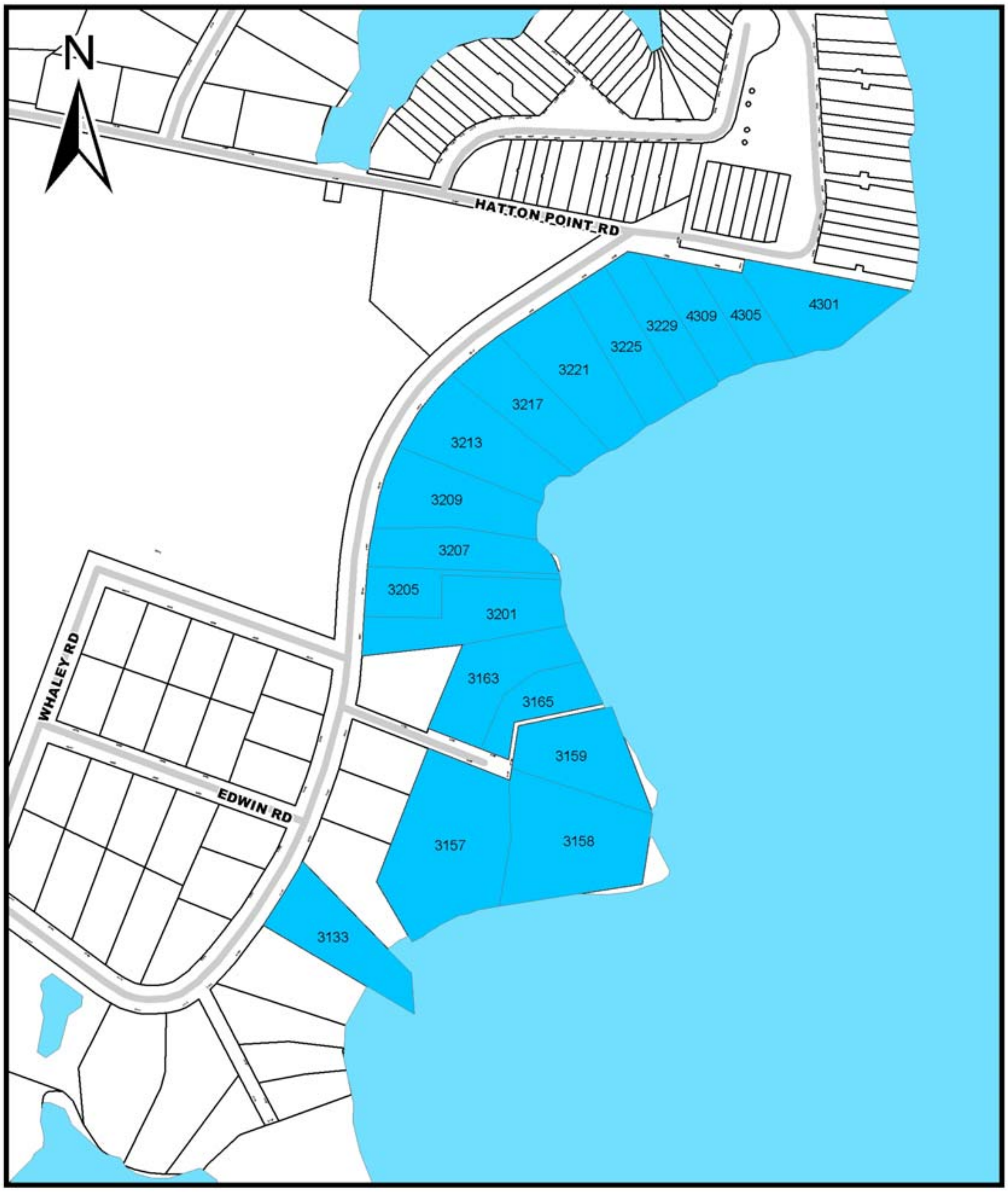
REPETITIVE LOSS MAP 26

REPETITIVE LOSS PARCEL



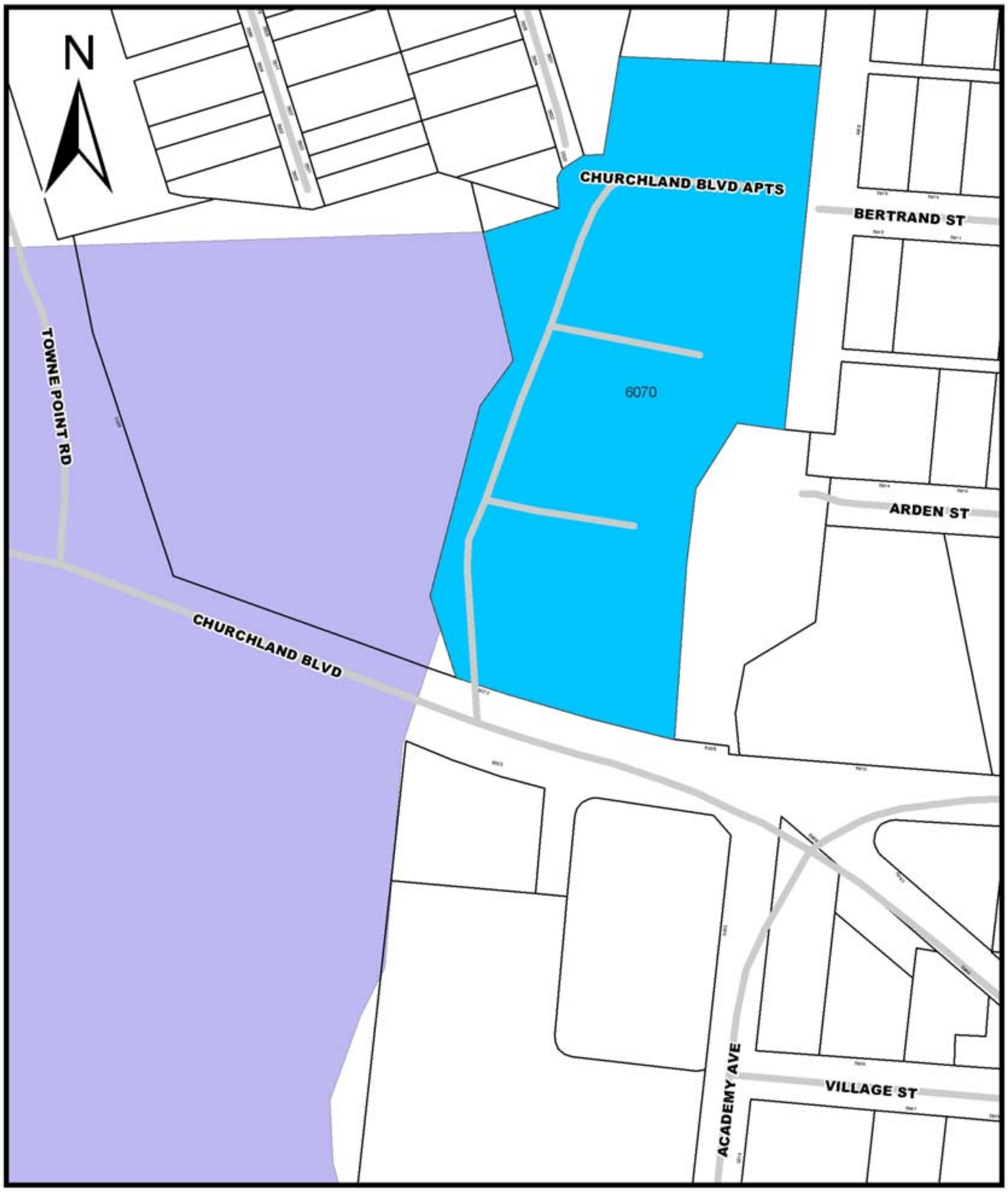
REPETITIVE LOSS MAP 27

REPETITIVE LOSS PARCEL



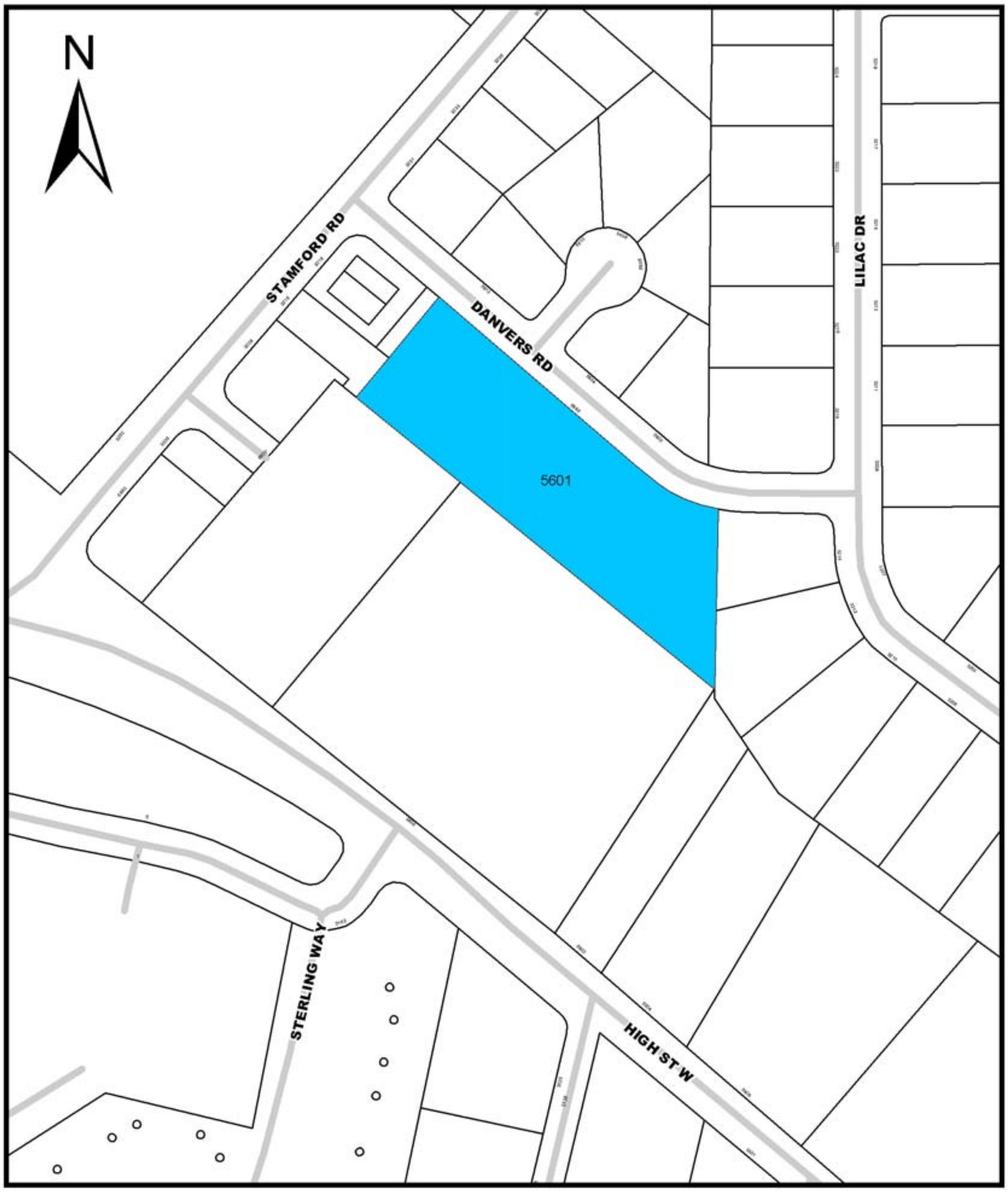
REPETITIVE LOSS MAP 28

REPETITIVE LOSS PARCEL



REPETITIVE LOSS MAP 29

REPETITIVE LOSS PARCEL

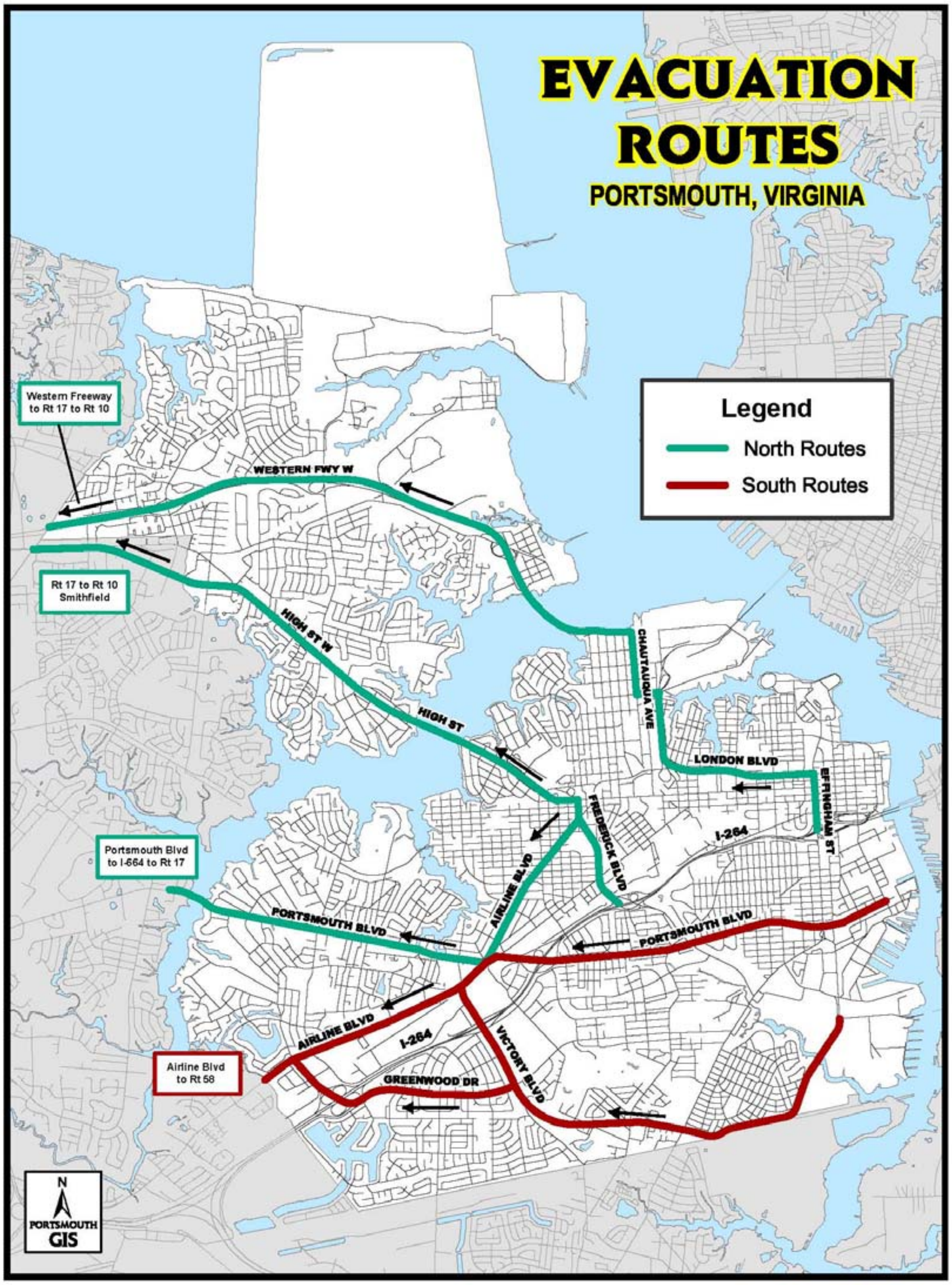


REPETITIVE LOSS MAP 29a

REPETITIVE LOSS PARCEL

I. Annexation Map

J. Evacuation Routes



K. Links

Interactive map for Portsmouth that includes 1983 and current flood insurance Rate maps, Storm Serge maps, evacuation zones and pick up locations
http://www.portsmouthva.gov/website/intersect_in/viewer.htm

Portsmouth Planning main website
http://www.portsmouthva.gov/planning/

Portsmouth Planning website dealing with flooding issues

http://www.portsmouthva.gov/planning/flood.aspx

Portsmouth Emergency Operations Center website
http://www.portsmouthva.gov/eoc/

Federal Emergency Management Agency website
http://www.fema.gov/

FEMA Flood information site
http://www.fema.gov/hazard/flood/info.shtm

National Flood Insurance Program site
http://www.fema.gov/about/programs/nfip/index.shtm

Community Rating System site
http://www.fema.gov/business/nfip/crs.shtm

Red Cross site
http://www.redcross.org/

National Hurricane Center site
http://www.nhc.noaa.gov/

Current weather site
http://www.weather.com/

Prevent Flood Damages site
http://www.fema.gov/plan/prevent/floodplain/techbul.shtm

Individual preparedness site
http://www.portsmouthva.gov/eoc/preparednessguides.asp

Business Preparedness Guides
http://www.cdc.gov/niosh/topics/emres/business.html

Preparedness site for pet owners
http://www.portsmouthva.gov/eoc/Preparingyourpets.asp

Preparedness site for persons with special needs
http://www.portsmouthva.gov/eoc/specialneeds.asp

Virginia Department of Conservation and Recreation
http://www.dcr.virginia.gov

Virginia Department of Emergency Management
http://www.vdem.state.va.us

Road conditions
http://www.511virginia.org or dial 511 from any phone for real-time traffic information and road condition reports.

L. CRS Task Force Resolution

R-05-14

A RESOLUTION CREATING AND APPOINTING MEMBERS OF A TASK FORCE TO DEVELOP A FLOOD PLAIN MANAGEMENT PLAN.

WHEREAS the City of Portsmouth desires to protect its citizens from damage and injury resulting from flooding and,

WHEREAS the U.S. federal government has adopted numerous programs to reduce the effects of flood damage and,

WHEREAS the City of Portsmouth is a participating community in good standing in the National Flood Insurance Program and,

WHEREAS the City of Portsmouth is one of sixteen communities within the Commonwealth of Virginia participating in the Community Rating System Program of the National Flood Insurance Program and,

WHEREAS in order to continue in this worthwhile and necessary program the City of Portsmouth, Virginia must adopt a "Flood Plain Management Plan."

NOW THEREFORE BE IT RESOLVED by the Council of the City of Portsmouth, Virginia that there is hereby created the Flood Plain Management Plan Task Force whose duty shall be to prepare a "Flood Plain Management Plan" in a manner as required by the Community Rating System Coordinators Manual.

BE IT FURTHER RESOLVED that the Task Force shall be composed of the following city staff members:

Deputy City Manager
Director of Planning and Zoning
Director of Engineering
Building Official
Director of General Services
Director of Public Works/Utilities
Fire Chief
Police Chief
CRS Coordinator
Director of Information Technology

BE IT FURTHER RESOLVED that the City Manager may appoint up to three additional members to the Task Force should he deem it necessary.

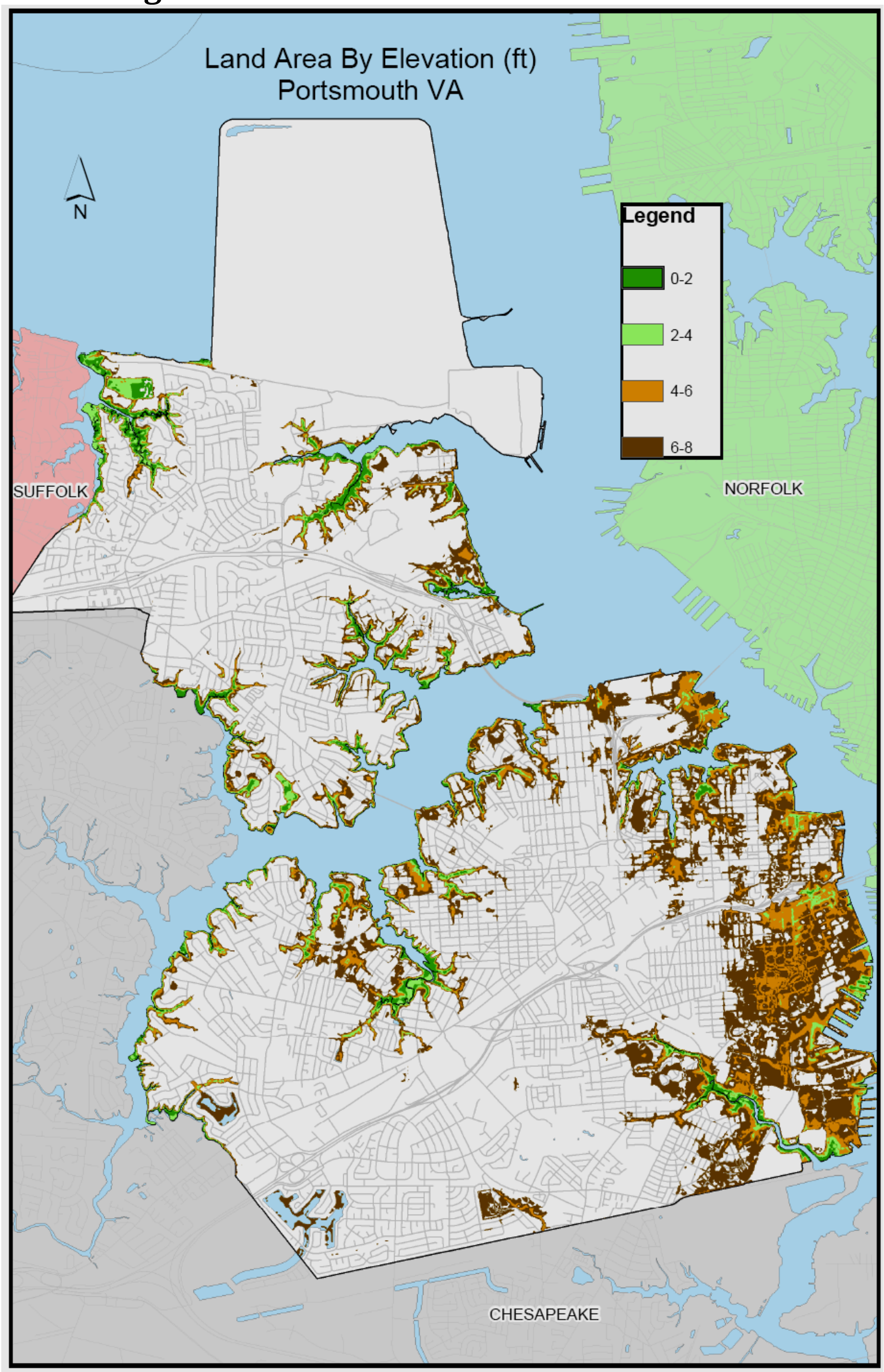
BE IT FURTHER RESOLVED that the Task Force shall complete its work and present a proposed Flood Plain Management Plan to the City Council for adoption by September 1, 2005.

ADOPTED by the Council of the City of Portsmouth, Virginia at a meeting held on April 12, 2005.

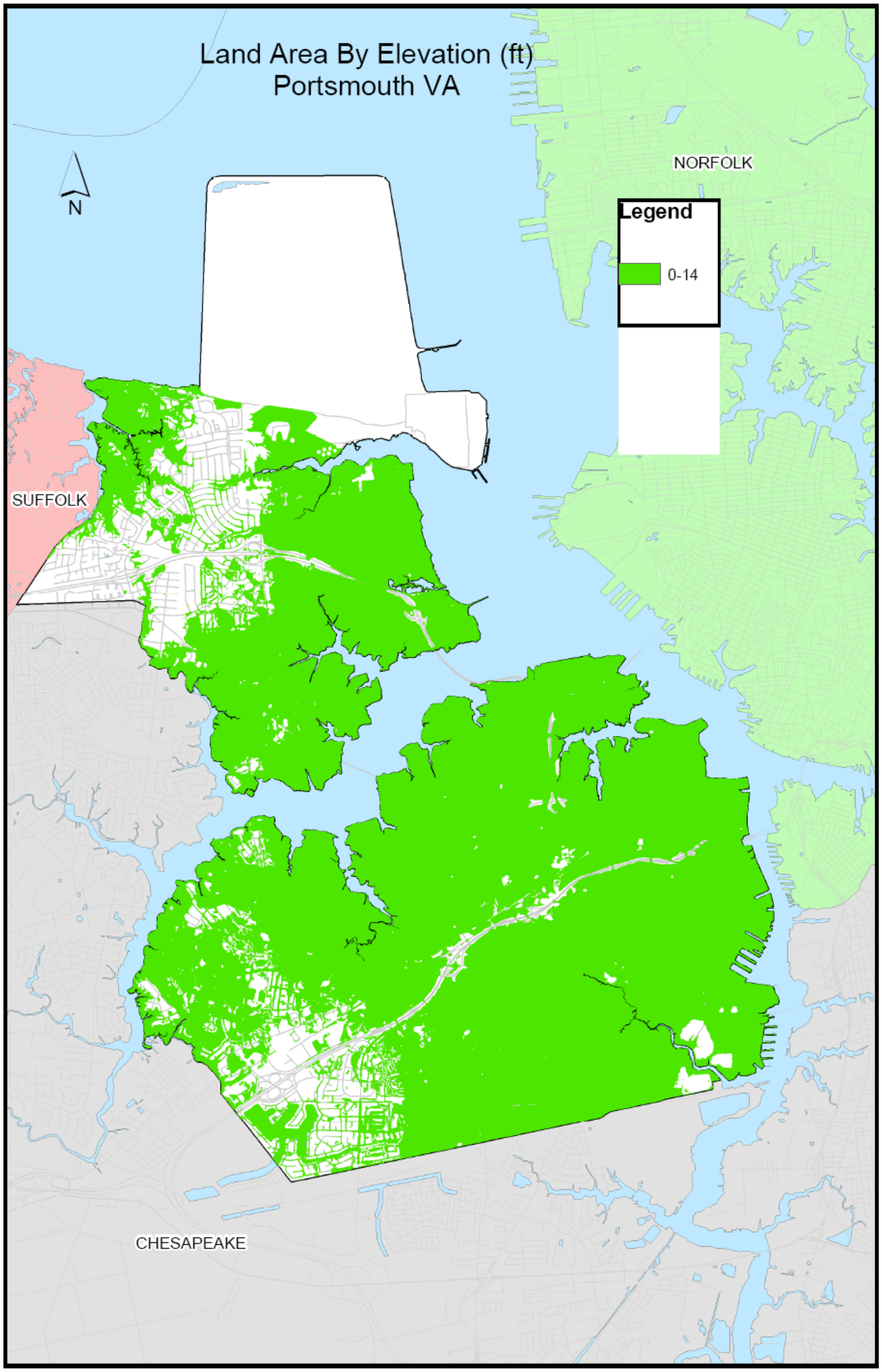
Teste:

City Clerk

M. Rising Sea Level Estimates



O. Areas Inundated 0-6 feet and Areas in Hazard Flood Zones After a Rise of 6 Feet in Sea Level



Q. Portsmouth Statistics

	Portsmouth	Virginia
Population, 2006 estimate	101,377	7,642,884
Population, percent change, April 1, 2000 to July 1, 2006	0.8%	8.0%
2000 figures		
Population,	100,565	7,078,515
Persons under 5 years old, percent,	7.1%	6.5%
Persons under 18 years old, percent,	25.7%	24.6%
Persons 65 years old and over, percent,	13.8%	11.2%
Female persons, percent,	51.7%	51.0%
White persons, percent,	45.8%	72.3%
Black persons, percent,	50.6%	19.6%
American Indian and Alaska Native persons, percent,	0.5%	0.3%
Asian persons, percent,	0.8%	3.7%
Native Hawaiian and Other Pacific Islander, percent,	0.1%	0.1%
Persons reporting two or more races, percent,	1.6%	2.0%
Persons of Hispanic or Latino origin, percent,	1.7%	4.7%
Living in same house in 1995 and 2000, pct 5 yrs old & over	51.4%	52.2%
Foreign born persons, percent,	1.6%	8.1%
Language other than English spoken at home, pct age 5+,	4.6%	11.1%
High school graduates, percent of persons age 25+,	75.2%	81.5%
Bachelor's degree or higher, pct of persons age 25+,	13.8%	29.5%
Mean travel time to work (minutes), workers age 16+,	23.8	27.0
Housing units,	41,605	2,904,192
Homeownership rate,	58.6%	68.1%
Median value of owner-occupied housing units,	$81,300	$125,400
Households,	38,170	2,699,173
Persons per household,	2.51	2.54
Median household income, 1999	$33,742	$46,677
Per capita money income, 1999	$16,507	$23,975
Persons below poverty, percent, 1999	16.2%	9.6%

22% of the population over 5 years of age have a handicap

72.5% of the residential parcels of land are owner occupied

28.4% of the units are in multi-family developments

57% of the students in the school system qualify for free or reduced lunches